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JANUARY 1958

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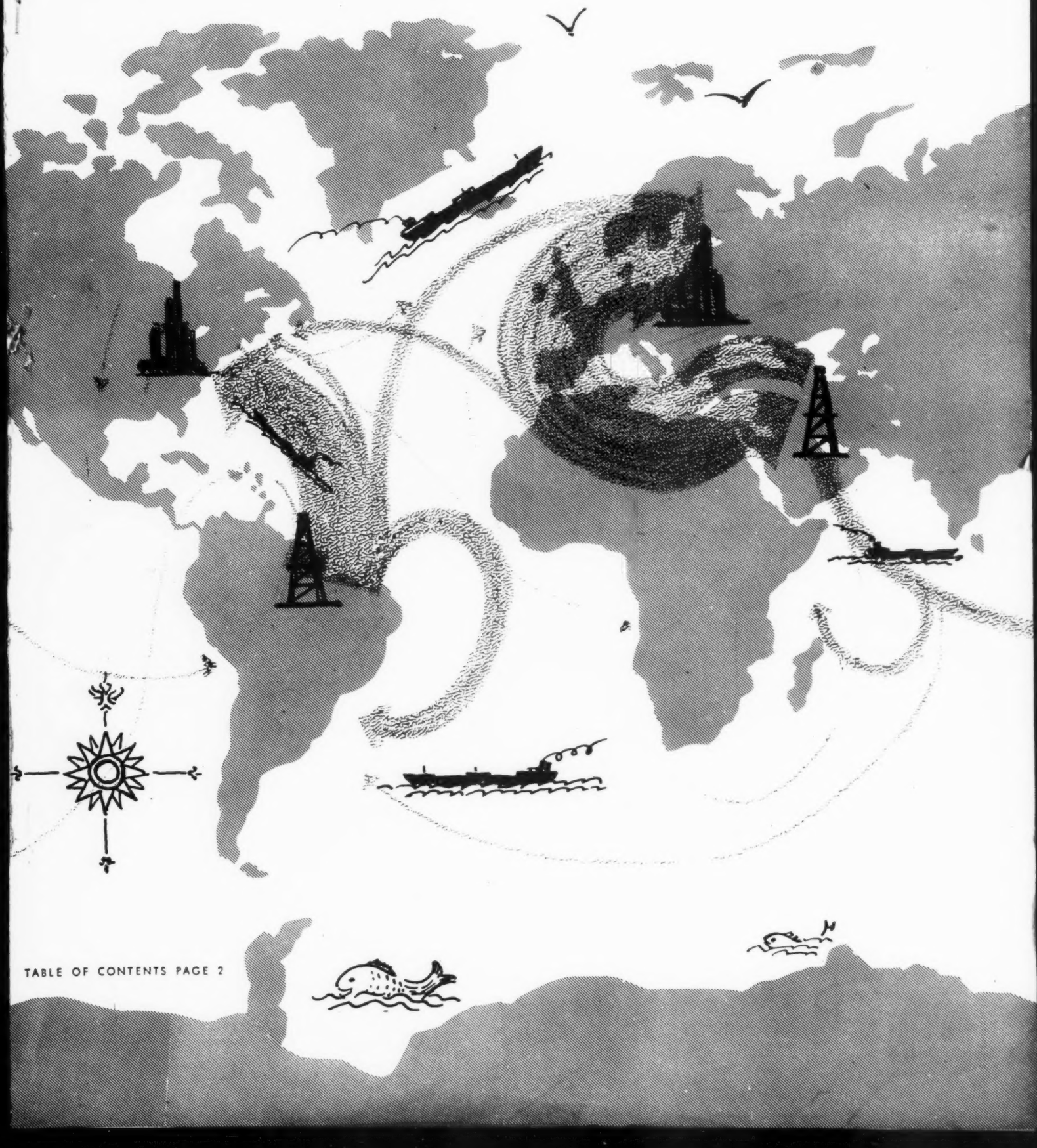

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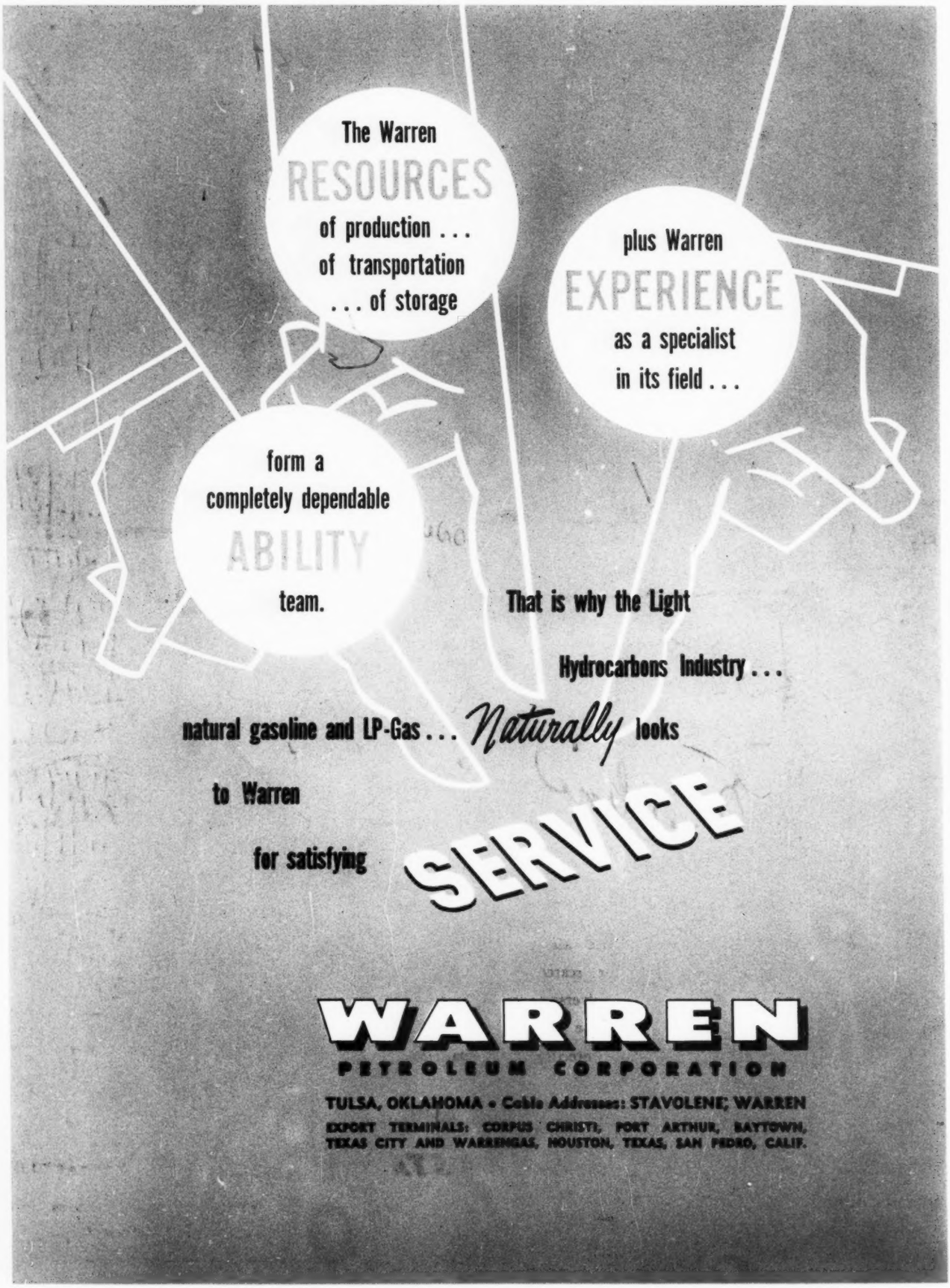
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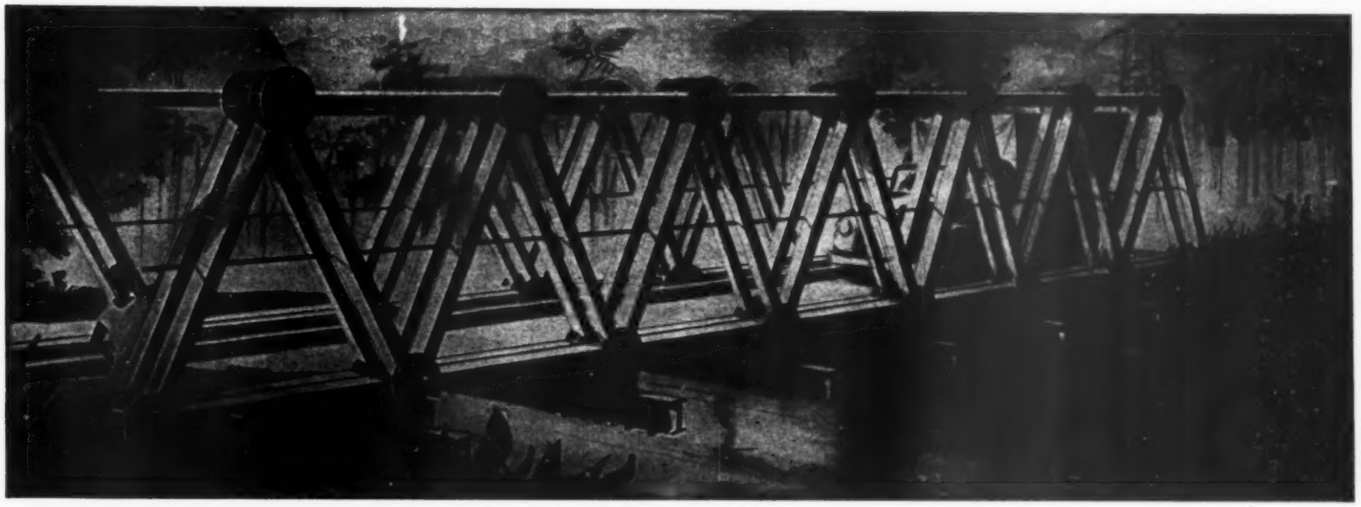

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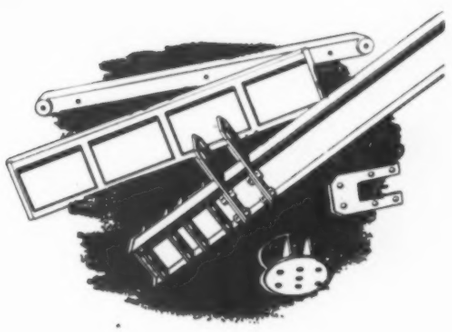

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VOL. 29 NO. 1 JANUARY, 1958

World Petroleum

THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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THIS MONTH'S COVER

How oil will flow in 1958 and to where—is the subject of the artist's sketch. The growing oil needs of the world are being increasingly supplied by tanker to provide flexibility to meet such crises as Suez provided in 1956 and 1957, and the first sign of this change is the arrow leading around the tip of Africa to Europe from the Middle East. It represents the "mammoth" deep-draft tanker, that can economically make the 15,000-mile trip around Africa rather than transit Suez with a lighter load.

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NEW LUMMUS DELAYED COKER FOR SOCONY MOBIL WILL CHARGE 19,000 B/D

Project scheduled for completion in early 1959

Socony Mobil has chosen Lummus to design, engineer and construct a 765 ton-per-day delayed coker for their Paulsboro, New Jersey, refinery.

The equipment is being designed for 19,000 barrels per day of charge composed largely of heavy mixed residual tars, supplemented with heavy vacuum gas oil stocks. Products will include — in addition to 765 tons of coke per day — dry gas and hydrogen sulfide, butane and butylenes, light and heavy gasoline, and light and heavy oil.

This installation will contain two separate coking heaters for greater flexibility, and four coke drums measuring 19 feet by 63 feet tangent to tangent. Other facilities include sections for fractionation, dehexanization, gas recovery, hydrogen sulfide recovery, coke handling, and related utilities.

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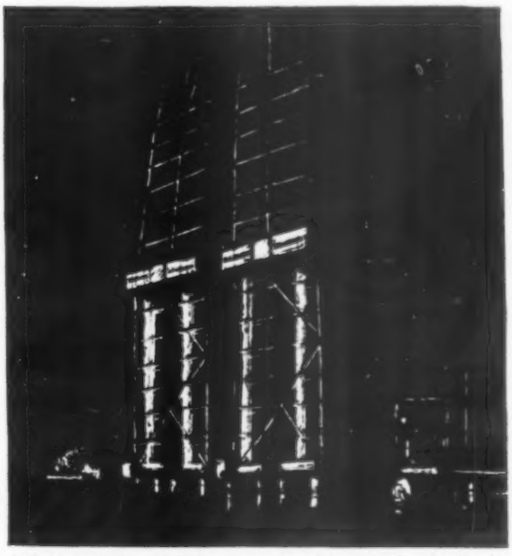

Artist's rendering of 765 ton-per-day delayed coker for Paulsboro, N. J., refinery of Socony Mobil.

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Washington PIPE LINE

by Joseph Huttlinger

The USA is thinking of adding a penny to the federal tax on gasoline to finance the national highway system. Now, the federal tax is three cents a gallon. States have varying taxes in addition—some of them seven cents. Cities at times have their taxes, too.

Chances are, there'll be only a hint it would be nice to have a higher tax in January when highway officials report to Congress on the current big highway program. A year or two off, a hard pitch for a higher tax could be made.

Now, highway officials find the road program is costing more than the $24.8 billion estimated through 1972. Inflation alone has added $3 billion. States are hiking their estimates of construction needed. Overall, the total cost to the USA will be $30 billion at least, and perhaps $50 billion.

New Oil Importers

A dozen more USA oil companies are becoming crude-oil importers, on top of 22 which have been bringing in crude for years to the USA East and Gulf Coasts, and others which have been bringing it to the West Coast.

The major reason is that foreign oil, at present, tends to be cheaper than USA oil for a refinery located at or near the seaboard. Whether this will last is to be seen. Entry of newcomers is playing hob with the USA program to limit crude imports by voluntary action of oil companies. Each newcomer means that much more crude coming in.

Superior Oil Co., and Caminol Co., of California, have advised the Department of the Interior they plan to bring more crude to the West Coast.

As for the East and West Coasts, Crown Central Petroleum Corp., with a refinery at Houston; Bay Petroleum Co., Dow Chemical Co., and Texas Asphalt and Refining Co. now are listed as importing companies.

Six others have advised Interior they plan to bring in crude to East and Gulf Coasts. They are Falcon Petroleum Corp., Houston; Southeastern Refineries Inc., Augusta, Ga.; United Refining Co., Warren, Pa.; International Oil Corp., Dover, Del.; Central American Oil and Mining Co., Dallas; and Frontier Refining Co., Denver.

The newcomers, if they bring in all the crude they plan to, could add more than 100,000 b/d to crude imports to the USA.

USA oil companies plan to bring 343,000 b/d of crude-oil imports to the US West Coast during the first half of 1958. The figure is based on reports of 17 companies to the government and on an estimate of imports by The Texas Co. H. J. Barton, of the Office of Oil and Gas of the Department of the Interior, disclosed the figures at a hearing by Navy Captain M. V. Carson, Jr., crude-oil imports administrator. The hearing was held, November 25 and 26, to gather facts for the cabinet committee on crude-oil imports.

The committee has set forth specific, suggested import quotas for companies importing crude into East and Gulf Coasts, Districts I through IV. It has been studying doing the same for imports into the West Coast, District V.

By and large, US producers—both in California and elsewhere—have suggested specific quotas be set for imports to the West Coast in an effort to hold the line. The Conservation Committee of California has taken no position, but set out that production is 12,000 b/d above maximum efficient rate in the state as Caifornia fights to meet demands. And importers have said a high level of imports is needed to meet demands.

During much of 1957, the target for imports to the West Coast was about 275,000 b/d. Stark Fox, executive vice president of the Oil Producers Agency of California, suggested a proper level of imports is 173,000 b/d. The planned imports to the West Coast by companies, as reported to the government, and disclosed by Barton are as follows, in barrels per day: Caminol, 7,500; Douglas, 4,700; Edgington, 3,000; Fletcher, 5,700; General, 27,400; Hancock, 3,600; Mohawk, 3,800; Richfield, 26,900; Shell, 35,000; Sunland, 2,500; Superior, 35,000; Tidewater, 51,000; Union, 14,000; US Oil & Refining, 11,700; Wilshire, 30,800; Standard (California), 55,200; Macmillan, 2,500; total 320,300 b/d.

With Texas Co. 23,100 (estimated), total would be 343,400 b/d.

Study Long-Range Defense

Gordon Gray, defense mobilizer, has launched a study to find "a long-range national security-policy" for petroleum. Working in cooperation with the Department of Defense, Interior and State, cheifly, but also with anyone else able to help in government, the months' long study will start with assumptions as to the damage which might be done to the industry in a war, and the ability of the industry, then, to supply products as needed for war and civilian use. Aim of the study is to get facts upon which the USA could rely at this time to take actions to keep oil strong.

Oil-Refining Dividends Higher

Cash dividends paid by oil-refining companies are running substantially ahead of those of last year. In the first 10 months of this year, dividends came to $1,008,000,000, compared with $931,000,000 in the first 10 months of last year, according to Department of Commerce.

Gas Companies Spend $2 Billion

A total of $2 billion for construction is likely to be spent by gas companies during 1958, it is estimated in a construction forecast by the US Department of Labor. This is double the spending rate of three years ago. A total of $1,400 million was spent by gas utilities in 1956 and $1,800 million in 1957, the department estimated.

O'Mahoney Presses Oil Issue

Senator Joseph C. O'Mahoney, (D., Wyo.) is again pressing the antitrust battle against the oil industry. This, in itself, is not new, but there is one change. Years ago, Mr. O'Mahoney used the rifle, aiming at one phase of oil at a time. Now, he uses the shotgun.

In a recent letter to Attorney General William P. Rogers, he asked: (1) the "floodlight" of publicity be turned on negotiations which may lead to a consent settlement of the years-old "oil cartel" antitrust charges against several major oil companies; (2) "a clearcut anti-cartel" policy by the USA, including steps to force Arabian-American Oil Co. to sell to anyone, not just the four owning companies; (3) study of steps to forbid companies to own jointly oil producing, transporting, and refining operations—especially outside the USA; (4) whether the government is trying to undo past mergers in the oil pipeline field, explaining there is need for allout effort to "restore" pipeline competition; and (5) a list of all instances where the Department of Justice considered easing up antitrust law enforcement in petroleum because of foreign policy or national security considerations.

Depletion Allowance Scrutinized

The USA is taking a new look at the income-tax depletion allowance for crude-oil and natural-gas production as it beefs up defense spending in the wake of the Soviet Sputniks. The allowance permits oil and gas producers to retain some income which otherwise they would pay out in taxes to Uncle Sam.

While persons close to the industry contend the allowance is absolutely essential as an incentive, others see it as a place for the government to pick up additional revenue. Up to half a billion a year might be raked in this way, they say.

President Eisenhower is expected to ask no change in his budget message to Congress in January, although he will propose an all-time high peacetime spending and taxation program.

The Congress is scheduled to look into depletion in general income-tax hearings starting January 7. Other depletion hearings are expected during the year. All of them have added steam in view of pressure for higher rather than lower tax rates.

Secretary of the Treasury Robert B. Anderson is the key figure in tax proposals of the Eisenhower administration, but he is in a difficult position. As a former oil man, any defense of depletion he may make within the cabinet is apt to be suspect. His predecessor, George Humphrey, was in a better position to defend the allowance, for he came from the coal industry. Mr. Humphrey said the present rate of depletion, 27.5%, is "working out about right."

4-Corners Line Complete

R. G. McIntyre, president of the Four Corners Pipe Line Co., said his line to the Los Angeles area is to be completed February, 1958. In a letter to M. V. Carson, Jr., crude oil imports administrator, he said the 16-inch line will have a capacity of 70,000 barrels daily of crude oil at the start. By adding pumps, he said, this could be raised to 170,000 barrels daily. The letter reported nominations of 42,000 barrels daily for the line, which is being used as fill to start off. The nominations, he said, indicate the amount of crude oil available at the start for the line.

Gas Use Grows In California

The growth of natural gas service in California, Oregon and Washington is cutting into demands for residual fuel oil. In the third quarter of 1957, the demand for residual oil was down 19% from the year before; in the fourth quarter, it was down 14% from the same quarter a year earlier. The drop in residual demand is expected to continue during 1958. This drop, in fact, is the main reason why total oil demand in District 5, the U.S. Far West, is expected to be only 1,330,000 b/d, down 1.6% from the same period a year earlier. In the second quarter of 1958, District five total demand is expected to be 1,230,000 b/d, up 0.2% from a year earlier.

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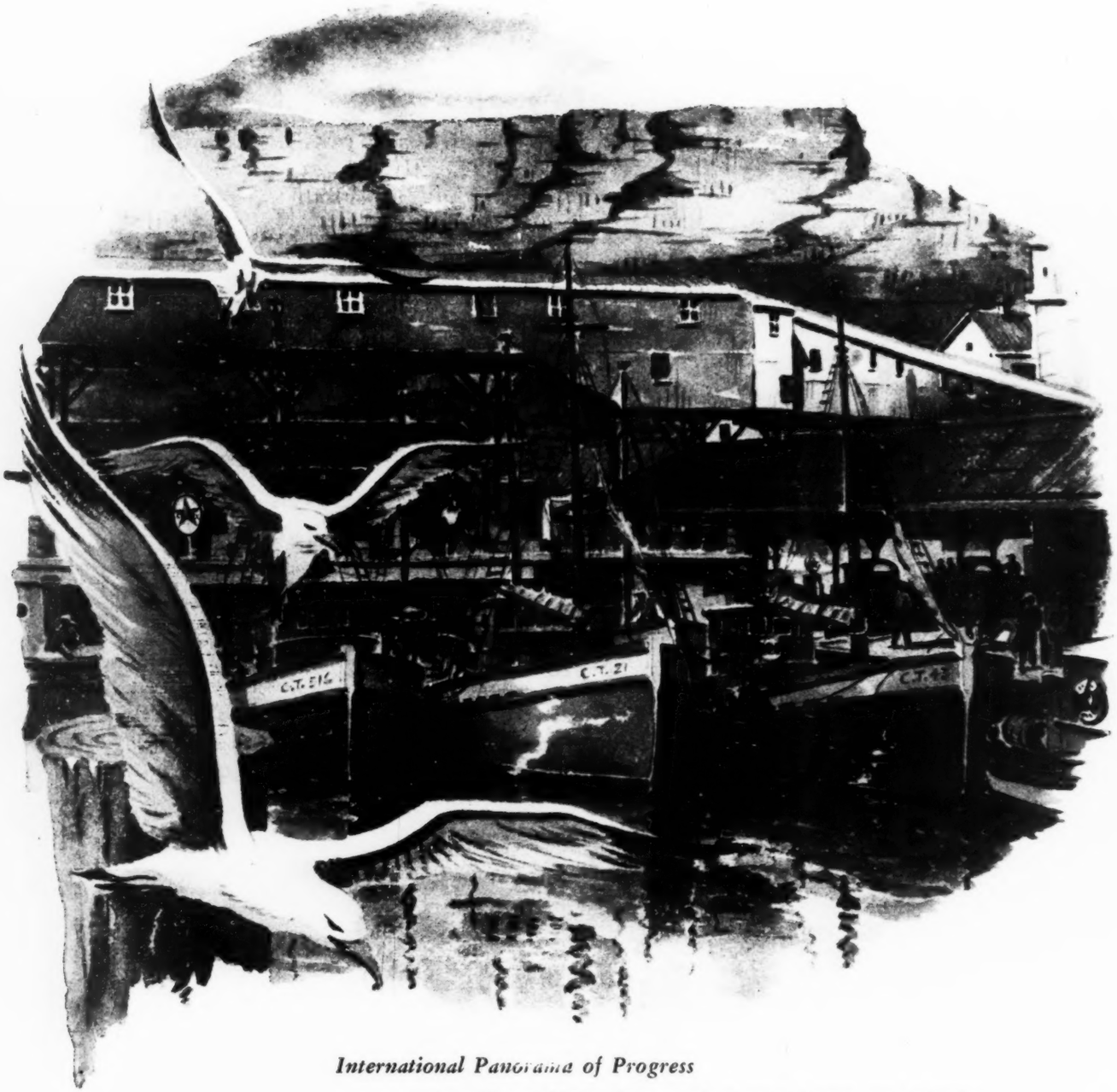

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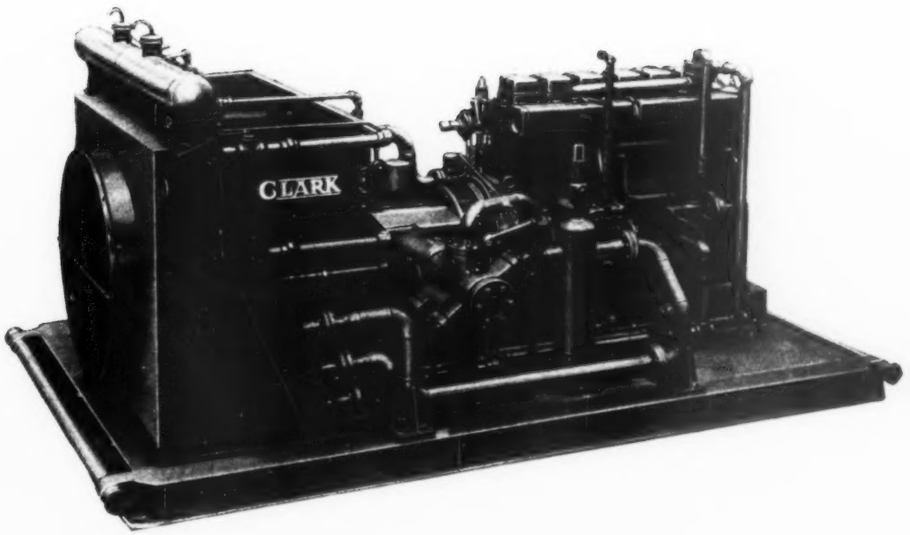

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Canadian Notes

Trans Canada Accidents Investigation

Investigations by the federal Board of Transport Commissioners into causes behind explosions occurring during testing operations of the Trans-Canada pipeline at several prairie points this fall thus far have drawn a blank.

Prime Minister Diefenbaker said in reply to an inquiry that in all cases the board had been unable to find the "defects or reasons" for the breaks which occurred after the pipe had been laid. The blasts appeared to have been on longitudinal seams. All pipe had been tested under pressure at the production plants. Board investigations are continuing. Four blasts occurred in Manitoba within a month. Breaks were repaired swiftly.

Pipeline for Canada's Oil Sands

The Bituminous Oil Pipeline Co. has been formed to build a 250-mile line from the oil-sands area of northeastern Alberta to Edmonton. New company is owned jointly by Royalite Oil Co. Ltd. and Can-America Oil Sands Development Ltd., partners in a $50 million project announced early in 1957 to use the Coulson process of centrifugal force to bring about commercial production from oil sands. Size of the line has not yet been announced.

Appointed Zone Manager

F. D. Aaring has been appointed zone manager of the Calgary production zone, British American Oil Co. Ltd., effective November 15, 1957. Mr. Aaring assumes the position vacated by K. H. Gibson.

A native Albertan, Mr. Aaring will be responsible for production operations in northern and southern Alberta, British Columbia, and the Northwest territories.

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Coke Plant for Western Canada

Consumers' Cooperative Refineries Ltd. will begin in 1958 construction of a $1.3 million plant for manufacture of petroleum coke in Regina. With 3,000 b/d crude runs, plant's coke output should be 145 tons—with 70,000 gal of liquid oil products. Coke will be used for aluminum and other metals' production—chief market in Kitimat, B. C.

Cat Reformer for Western Canada

North Star Oil Ltd., Winnipeg, has completed plans for installation of a $1.5 million catalytic reforming unit at its 12,000 b/d refinery at St. Boniface, Manitoba. Company's St. Boniface refinery was built two years ago at a cost of $12 million.

Potts Appointment at Autocar

Frank Potts, former manager of the Montreal branch of The White Motor Co. of Canada Ltd., has been appointed assistant to Karl A. Roesch, vice president of The White Motor Co. and general manager of the Autocar Division, Exton, Pa. He succeeds Robert G. Oakley who recently became White's branch manager at Cleveland, Ohio.

Mr. Potts, who was Montreal branch manager from 1953 until now, first joined the White organization in 1952 as general sales manager of the Sterling Division. Previously, in Canada, he was equipment engineer of the Highway Paving Co. and mechanical superintendent of the Provincial Transport Co.

Interprovincial Personnel Changes

Interprovincial Pipe Line Co., Edmonton, has announced several personnel changes resulting from recent completion of the company's 156-mile extension from Sarnia, Ont., to Port Credit, Ont., and the company's long-range executive training program. F. G. Dawson, formerly management assistant in the executive offices in Toronto, has been appointed chief dispatcher of Interprovincial in Edmonton; A. B. Jones, formerly assistant chief engineer, has been transferred to Toronto as management assistant; R. K. Heule, formerly management assistant in Toronto, has been transferred to Edmonton as management assistant. C. H. Bucklee has been appointed assistant chief engineer of the 1,931-mile crude-oil pipeline.

Westspur Safe

Westspur Pipe Line Co., Regina, wants to remove federal jurisdiction over its gathering lines in southeastern Saskatchewan by selling these oil lines to a member company and thus placing them under provincial jurisdiction to speed operations. Now before the federal Board of Transport Commissioners, the plan raises a legal question as to whether a system of gathering lines within a province can be divorced in the matter of governmental jurisdiction from the mian transmission line.

With the main line remaining under federal control as an interprovincial line and the gathering system going to Saskatchewan government control, it is felt that any necessary quick operations could be carried out involving gathering lines without awaiting consent from Ottawa. The sale would be made by Westspur to Producers Pipelines Ltd. for an approximate price of $3,000,000. Westspur lines serve the Interprovincial Pipeline System.

Joffre Water Flood

Alberta's four-year-old Joffre oil field, approximately 13 miles northeast of Red Deer, is undergoing a water-flood program to make the most of the field's potential of 75,000,000 barrels.

Under the program through which water will be pumped into 26 injection wells, total recovery of 31,000,000 barrels of oil or 40% of the total amount of oil present is possible. This is 17,000,000 barrels more than believed possible otherwise.

As of July, 1957 the Viking sand field had produced an estimated 70,000,000 barrels from its 295 completed wells. Water flood was dictated by drops in natural gas pressure with resultant sharp drops in reservoir pressure.

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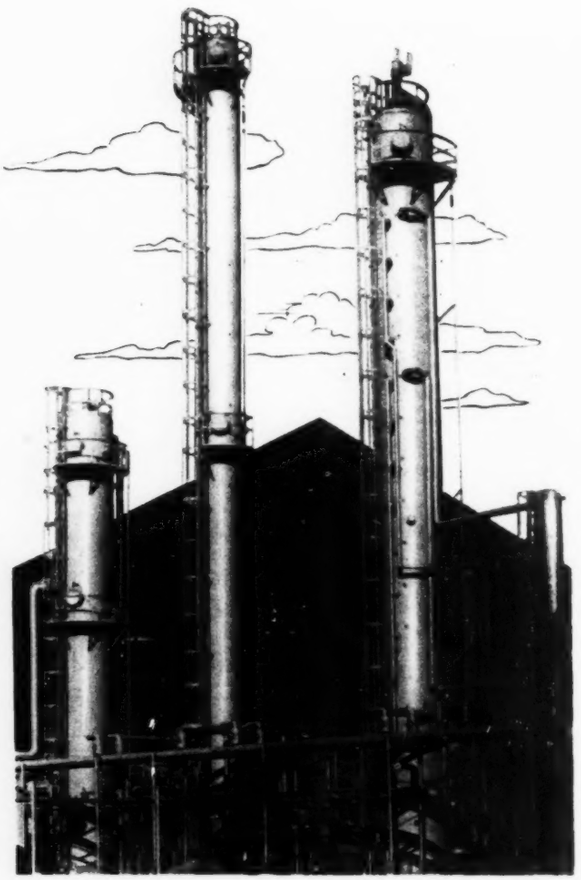

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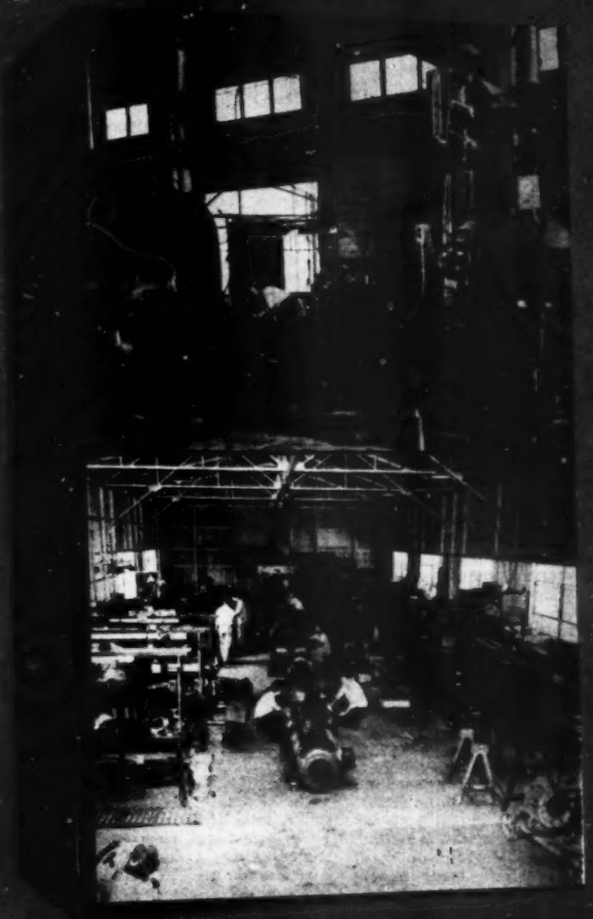

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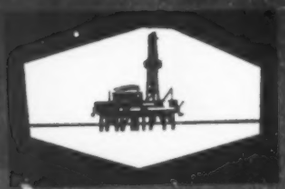
We are pleased to announce the formation of an Industrial Contracts Division. The function of this division will be to secure work of a varied industrial nature to fully utilize the diversified facilities of Avondale Industries.



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Latin American Oil News

Sun Gets Maracaibo Producer

Completion of SVSX Well No. 1 as an oil producer in Lake Maracaibo's Block No. 1 has been announced by the Venezuelan Sun Oil Co., Venezuelan Atlantic Refining Co., and Seaboard Oil Co. group. Although tests on the exploratory well are still continuing, it is expected that production will settle to about 500 b/d of 36.7-gravity sweet oil through 3/8-in. choke. According to Venezuelan Sun (the operator), the well is flowing from perforations in the Mito Juan horizon from 11,050 ft to 11,074 ft. Total depth is 13,700 ft. The group's second Lake Maracaibo well, Timoteo No. 2 in Tract V-574, is still drilling.

Bolivian Air Survey

Hycon Aerial Surveys Inc., of Pasadena, Calif., is now photographing some 35,000 square miles of Bolivia for the Bolivian Gulf Oil Corp., using specially equipped P-38 aircraft to fly photography from an altitude of 20,000 ft above mean terrain.

Selected areas are being flown in color photography at a mean terrain altitude of 10,000 ft to produce transparencies with relatively large image size. Hycon processes this color film in its Cochabamba laboratory.

Farmout In Panama

Cataract Mining Corp. has received $150,000 from the United Fruit Co. for one million acres of oil and gas concessions in the Province of Chiriqui, Panama. This was a down payment against an overriding royalty of 1½% on this acreage which will be actively developed by United Fruit.

In addition to the $150,000 paid to Cataract, United Fruit Co. made a "substantial" cash payment to Time Petroleum for its interest in the Chiriqui concession. Cataract still retains another 1,100,000-acre concession in the provinces of Chiriqui and Bocas del Toro, offsetting the concession which has been turned over to the Fruit Co. In addition, Cataract Mining Corp. holds substantial additional acreage in the provinces of Veraguas and Darien of the republic of Panama.

Mexico's Crude Drops 2.5%

Crude production in Mexico came to 252,000 b/d in first five months this year, or total 37,835,573 bbl—a drop of 2.4% from average 258,000 b/d first five months last year.

Exports of crude and fuel oil came to 8,469,334 bbl for the first five months of this year, down 25.3% from the 11,335,328 in first five months 1956. Refinery throughput same period was 59,717,655 bbl, up 4.4% from 57,188,824 a year earlier.

June production was 1,132,136 cubic meters of crude and natural distillates (one cubic meter equals 6.2898 bbl).

Kellogg Gets Uruguay's Refinery Contract

M. W. Kellogg Co., New York, has been awarded contract for Uruguay's $8.2 million refinery expansion at La Teja. Administracion Nacional de Combustibles Alcolhol y Portland awarded the contract.

New units are to be in operation late in 1959 or 1960. Uruquay expects to save $20 million foreign exchange in five years of operation of new units.

Guatemalan Concession To Esso

First concession in the second phase of the government's oil development program is 380,000 acres to Standard Oil Co. of New Jersey for six years in north Guatemala. It is extendible twice for a 2-year period. First phase comprised 1,560,000 acres to 25 companies. The government is studying 200 other applications recently filed.

Boost Mexico's Nationalization

Drastic tightening and extension of nationalization promulgated by former President Lazaro Cardenas in 1938 has been proposed by his followers in a six-point program: (1) To nationalize all basic industries—with "rigorous State control" until this has been accomplished. (2) Basic industries would be forced to serve the "progress" of agriculture, manufacturing, and transportation. (3) Industries in Mexican hands would be protected against foreign competition, including that from foreign investments within the national territory. (4) Legislation to control foreign investments and use of private foreign capital; intergovernmental banking and private financiers—foreign or international (5) Nationalization of private lending institutions—deposits to be invested in planned enterprises. (6) Limitation of profits of all enterprises—national and foreign.

The Cardenists' report describes petroleum as "the most important of Mexico's natural resources, and its development the chief of the basic industries. The expropriation and nationalization of 1938 has placed this wealth at the service of the national industrialization, in which it has been the principal factor broadening the domestic market and stimulating agriculture, manufacturing, transportation, and communications."

Recommendations for petroleum are so extensive as to amount virtually to a plan for the future of the Mexican industry. Leading proposals are: (a) Pemex should "inflexibly" eliminate unnecessary personnel, subsidies, and other burdens, and annul privileges enjoyed by certain companies in fuel and lubricant prices. (b) No petroleum-industry function should be entrusted to private interests—least of all foreigners. (c) Pemex should plan creation of national industries, financed by the State or Mexican capital—these decentralized enterprises to provide Pemex with raw materials, tools, machinery, and equipment indispensable to its development. (d) Deposits of raw materials for aiding the industry's development should go to Pemex or used for manufactures to stimulate the country's industrial development, markets, and foreign trade. (e) Pemex should investigate petroleum reserves—national foreign, and particularly American; future need and possibility of oil substitutes. (f) Mexican government should protect integrity and success of oil nationalization as the guarantee and foundation of the nation's real industrialization and independence. (g) Price realignment in accordance with the cost of petroleum products so the industry can promote industrialization. (h) Readjustments should include a low price level, but not below cost—in proportion to consumer's ability to pay and with price fixing for service, not profit. (i) National and state credit agencies should make Pemex preferential loans for expansion. If their resources are insufficient, they should be supplemented by domestic loans—never foreign. (j) Pemex program within a short time should attain: accelerated production; coordination between refinery installations and the demand for products; growth of oil and gas pipeline, storage, and distribution systems to insure adequate oil supply throughout the country at all times. (k) Harmful oil-product importation to be eliminated by an early equilibrium between production and national economic development. (l) Industry should conserve long-term nationalization objectives: to direct activities toward satisfaction of the domestic market and to produce surpluses for exportation—preferably eliminating crude in the quantity convenient to Mexico's economic development. (m) Oil industry should maximize petrochemical development to provide basic raw materials for Mexico's manufacturing industries.

New Venezuelan Lake Tests

About a dozen deep tests are being drilled on the new acreage acquired in Lake Maracaibo recently. The drilling companies included Shell, San Jacinto, Venezuelan Sun, Superior Oil of Venezuela, Creole, and Phillips.

New Venezuelan Well

The Atlantic Refining Co., under a farmout arrangement with Seaboard Oil Co., has successfully completed a wildcat well in the Pedernales area of Venezuela. There are 36,500 acres involved in this venture, each company holding a 50% interest. Known as Capure No. 2 A, the new well flowed 300 b/d of 22-gravity oil. It had been drilled to a total depth of 5,364 ft, where formation difficulties prevented further drilling. After plugging at this depth, it was tested at upper horizons, and final completion was made at 1,848 ft to 1,860 ft.

Atlantic previously had drilled the Capure No. 1 to a total depth of 10,003 ft, which was completed as a dry hole; and the Capure No. 2 was abandoned because of mechanical difficulties after reaching 3,152 ft.

Nicaraguan Drilling Stops

Waterford Oil Co. has ceased drilling, with no shows encountered over 15,000-ft depth. Location is 40 miles offshore.

New Cuban Concession Company

A new company formed to acquire oil and gas rights abroad has been formed by a USA group including H. N. Mallon, chairman of Dresser Industries; Rufus Brent, vice president, Producing Properties, Dallas; F. Lee Morre, Jr., Kidder, Peabody & Co., investment house in New York; and others. Ralph Bard, president, Chicago-Canadian Holdings Ltd., is president. The company has about 1.3 million acres of Cuban concessions, plus 20 million more in overriding royalties. DeGolyer & MacNaughton Inc. are geological consultants.

Guatemalan Well Planned

An exploratory well will be drilled by Coastal Plains Oil Co., which recently merged with Sloane Exploration Co. Location will be in Peten region, southern area.

Uruguay Refinery Expanded

The La Teja refinery at Montevideo is being expanded to 56,000 b/d crude capacity. M. W. Kellogg Co. is handling the expansion.

New Service Group in Venezuela

Petroservicios Consolidados SA, a new service group in Caracas, will offer marine services on Lake Maracaibo. Owned by 10 USA companies, it is headed by Dr. E. A. Acosta Hermoso.

Dutch Guiana Exploration

A total of $7.5 million in stock is to be sold by Surinam Corp., Houston, to finance exploration by a subsidiary, Colmar Surinam Oil Co., which has a concession over 3.7 million acres.

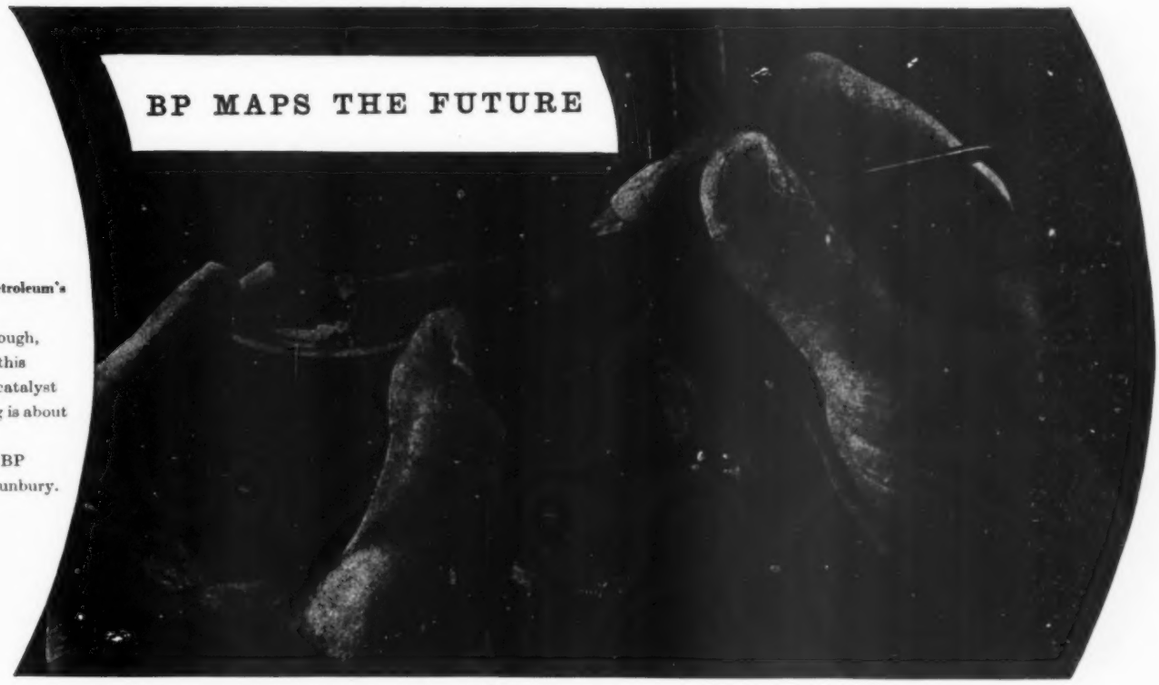
Pipeline in Argentina

Two pipelines will be built by a joint USA-Argentine group under a new $180 million contract signed in Buenos Aires. Fish Engineering Corp. and TIPSA, of Argentina, with North American Utility & Construction Co., participate in the operating firm known as International Pipeline Contractors Inc.

Two lines will be built—one 24-in. gas line 1,015 miles from Campo Duran to Buenos Aires and a 12-in. crude line from Tucuman to San Lorenzo refinery, some 580 miles. Contract is payable in soft currencies up to 85%.

Creole Net Up in Venezuela

Net earnings of Creole Petroleum Corp. were $97.2 million for the quarter ended September 30. This compared with about $81.9 million in the same quarter of last year. Total for first nine months 1956 was $318.8 million. Capital and exploration expenditures were up in first 9 months to $178 million.



The story of British Petroleum's world-wide activities begins, naturally enough, here in Britain. In this picture a sample of catalyst for use in oil refining is about to be analysed in a spectrometer at the BP Research Station, Sunbury.

How will these hands shape tomorrow's motoring?

WHOSE HANDS ARE THESE? They are the hands of a chemist at the research station of The British Petroleum Company at Sunbury-on-Thames. One of nearly 1,000 BP research workers whose main task is to conjure more and better products from one single substance – crude petroleum.

Among the many different users of oil products, no one has gained more than motorists and motor-cyclists from the work of these men and women. No one has more to gain in the future. To quote one example, BP Energol 'Visco-static', the all-weather motor oil which reduces engine wear by 80%, was a recent Sunbury triumph. The result of many months of patient research.

In 1917 Sunbury Research Station began with one modest house. Now it occupies thirty-nine acres and is still expanding. Besides its laboratory and development work, Sunbury carries out the most exhaustive proving-tests of BP products and processes. The latest major addition to its resources is a motor fuels engine-test laboratory, where cars can be tested at speeds up to more than 100 m.p.h. under temperature and humidity conditions equivalent to the most extreme tropical climates.

Thus, constant research ensures the supreme quality of BP products for use all over the world, and even more efficient fuels and oils for the engines of tomorrow. At Sunbury, the future takes shape today.

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It takes years of hard work and experience for a man to become a successful matador. It takes many years of careful breeding to develop the distinctly savage species of bulls used in the ring.

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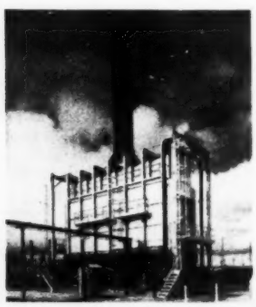

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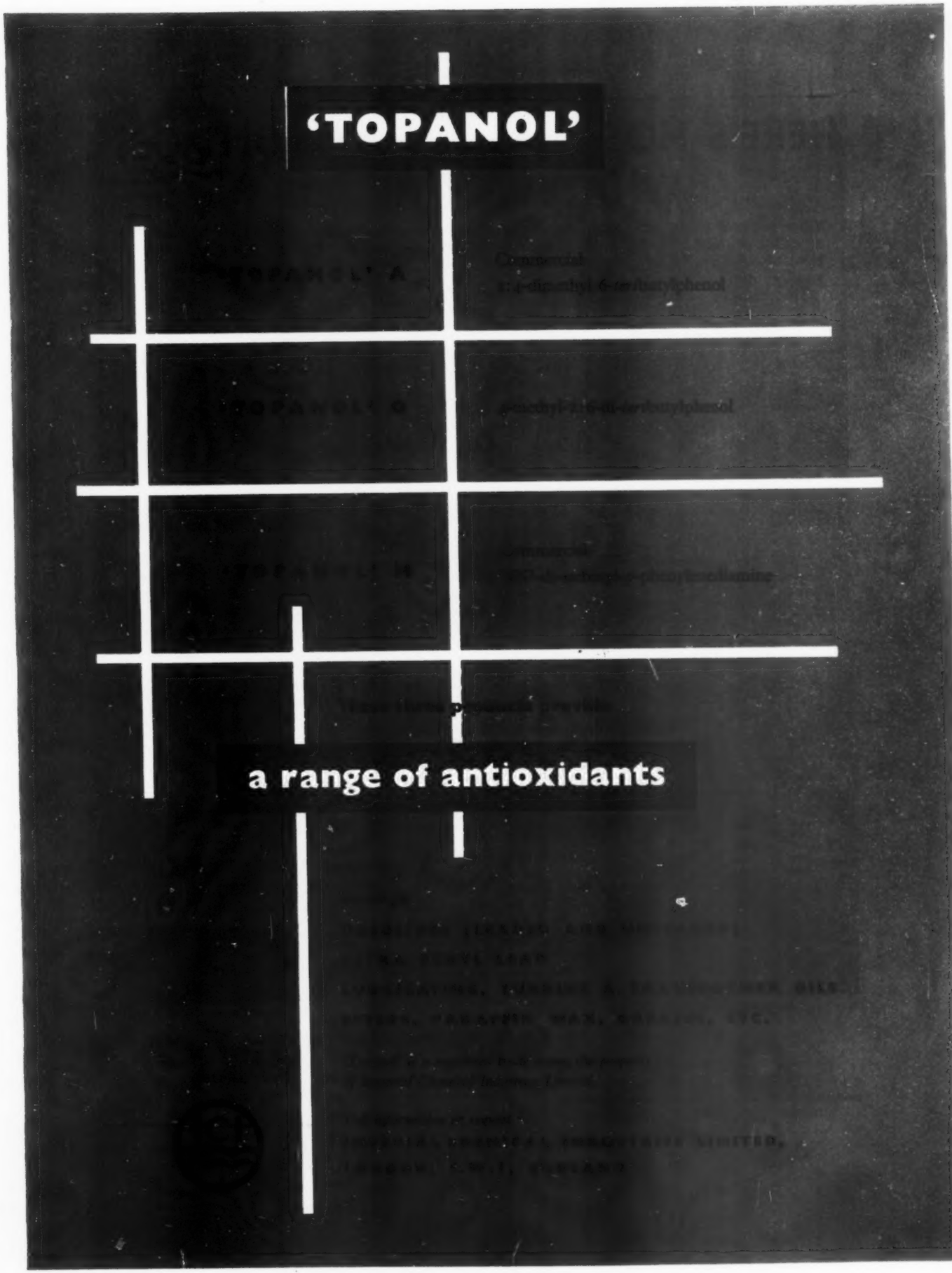
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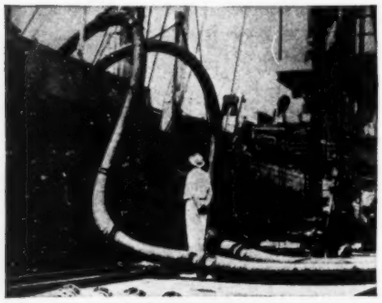
When you need top hose performance and value regardless of the job, you can always count on Hewitt-Robins Hose. It's engineered to match the toughest operating needs.

The complete line of Hewitt-Robins Hose is recognized as the leader throughout the entire petroleum industry. That's why you will always find it pays to specify Hewitt-Robins Hose for your needs. It's safer, lasts longer and is more economical.



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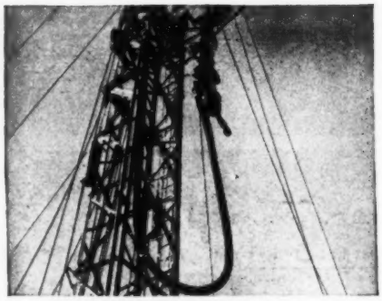

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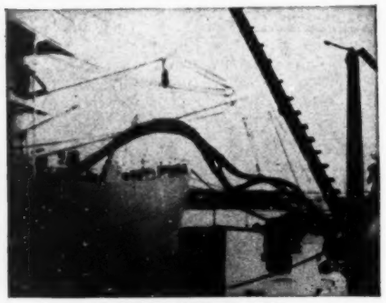

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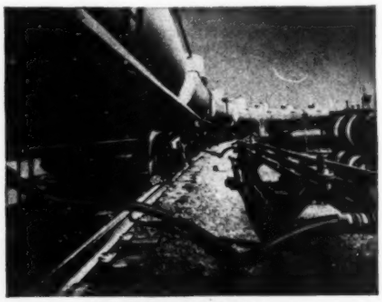
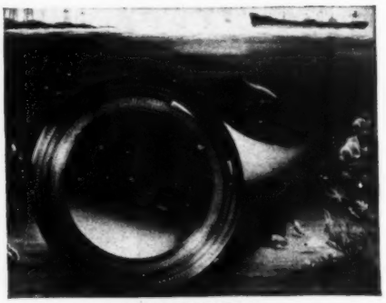
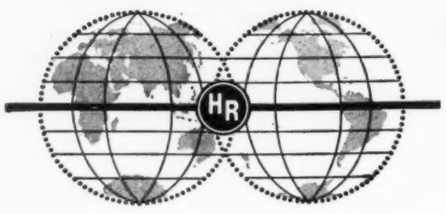


TANK CAR HOSE



SUBMARINE HOSE

TANK TRUCK HOSE



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Kellogg has the economic answer to high sulfur crudes. Working closely with the refiner's engineers, as it has done with those of leading oil companies on the East and Gulf Coasts—as well as in England, Belgium, France—Kellogg can design a unit to remove harmful sulfur compounds to almost any degree desired. In one typical instance, weight per cent was reduced from 0.84 to 0.08 in catalytic gas oil, and from 0.66 to 0.05 in furnace-oil distillate.

Optimum investment and operating costs are assured through designs that utilize selectively lower pressures, reduce the use of costly alloys such as 18-8, and lower the consumption of high pressure hydrogen.

Kellogg desulfurization units can be engineered to treat virgin streams of naphtha, kerosene, gas oil and other fuels, and cracked stocks of similar boiling ranges. Or units can be designed to operate simultaneously on streams from the topping and cracking units. Where desired, the design can include equipment to recover the sulfur as a salable by-product. Your inquiries will receive prompt attention.

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How Standard "beefs up" cattle to help meet the West's growing food needs

New Standard plant foods have produced twice as much beef from a single acre—enough extra beef to supply an average person for a solid year.

Who eats the most meat in the U.S.? You do—surveys show Westerners top the nation in meat consumption. Now Standard helps ranchers satisfy that hearty appetite with chemically blended plant foods,* so economical they can be used to turn unproductive foothills into profitable pasture-land.

These new blends of essential plant-growth elements come from a $16 million Standard plant opened just a year ago. Grasslands they have enriched are now producing up to *twice as much* beef per acre. Farmers find them equally productive on many other crops. For you they promise tastier, more nutritious meals for every dollar you spend on food.

Progress in the West means...

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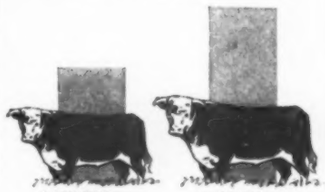

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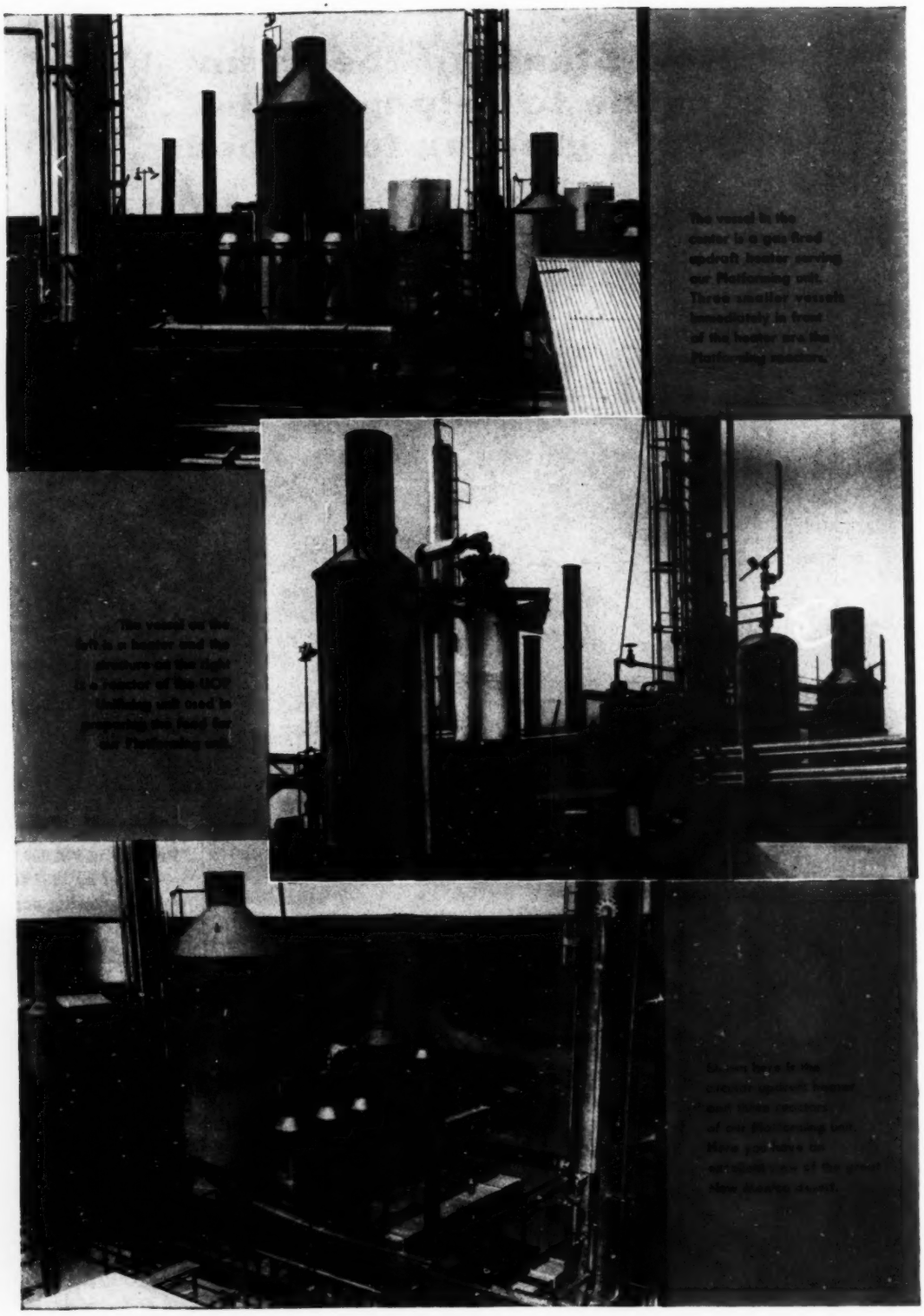


Famariss Produces High Octane Products From Platforming-Unifining Units

By Walter Famariss, Jr.
President
Famariss Oil and Refining Company
Hobbs, New Mexico

We have perhaps one of the smallest refineries marketing a finished product on the local level. Regardless of our size we are aware of our responsibility to offer customers a high octane number product consistent with the demands of today's high compression automobiles. Our search for a process to give us a high quality product plus low initial and operating costs led us to the Platforming process. In 1955 we placed on stream a 750 B/SD Platforming unit. To prepare the feed for the Platforming unit a 1000 B/SD Unifining unit was also installed.

Walter Famariss, Jr.

Famariss Raises Octane Number

With the addition of these units we were able to increase the octane number of our straight run gasoline from 68 RON to 97-98 RON giving our customers a quality product meeting the highest standards in our area. These new units enabled us to boost our total refinery throughput to 2,250 B/SD. Presently we are planning to expand our capacity 50 percent. Catalytic Cracking and additional Unifining facilities are processes being considered. The additional Unifining unit will be used for the treating of intermediates permitting us to enter new markets, thus substantially increasing the value of these products.

Growth Necessitates New Facilities

Perhaps you would be interested in our early growth and problems prior to the installation of the Platforming-Unifining units. Famariss Oil and Refining Company was formed in 1947 as an outlet for the marketing of a small amount of crude I was handling in this area. In 1949 we leased a small refinery at Monument, New Mexico, and in August we started operation of the refinery processing 450 barrels of oil per stream day. Market demands quickly exceeded this production. We therefore gradually increased production to the refinery's apparent maximum limit of 750 B/SD.

During this period all of our production was sold to other refineries for further processing. In 1951 we completed facilities for adding tetraethyl lead and the consequent tankage to enable our refinery to manufacture finished gasoline. We were then able to sell our motor fuel locally. So successful was our operation that in 1952 we purchased the Monument refinery from the leasor. We dismantled the refinery and moved the various structures and equipment one-half mile to a new location on our property. In just 90 days we were once again in production; this time throughput was increased to 1,200 B/SD.

UOP Aids In Solution Of Process Problems

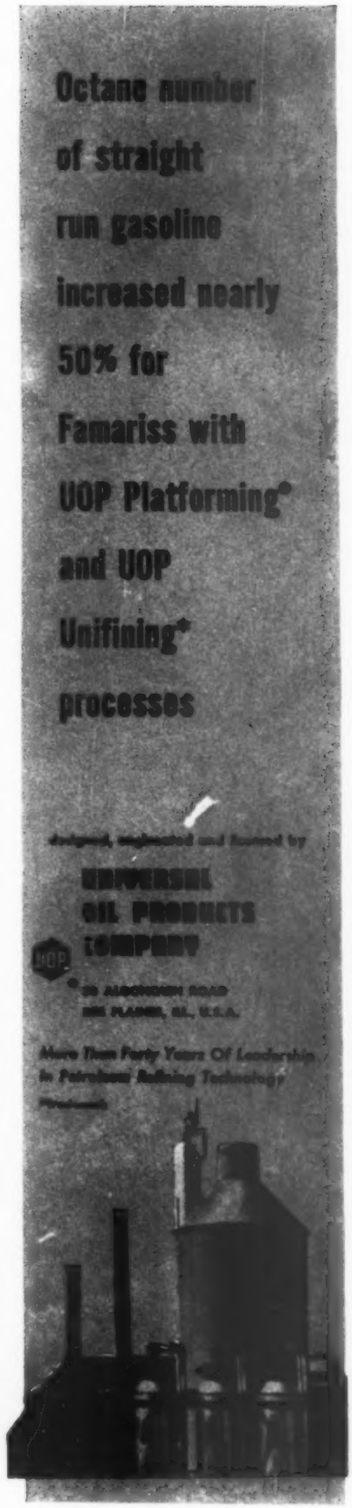
But soon again we faced the problem of increasing production to meet the rising demands of our marketing area—an area which includes all of New Mexico, West Texas and the eastern portion of Arizona. Yes, demand for our motor fuel was increasing but so were compression ratios of automobiles requiring a higher and higher octane number gasoline. This can be an excessively costly problem for a small refiner. In this regard we met with engineers of Universal Oil Products Company, licensor of petroleum refining processes. UOP analyzed our needs in view of our economic and financial framework and suggested the Platforming unit—with a Unifining unit to prepare the feed stock for more efficient processing in the Platformer. We are happy to report that this was an ideal solution. Originally designed for research octane number production of 93.5 we were able to produce a gasoline of 97-98 research octane number by increasing the severity rate somewhat, yet allowing for further octane number increases if desired.

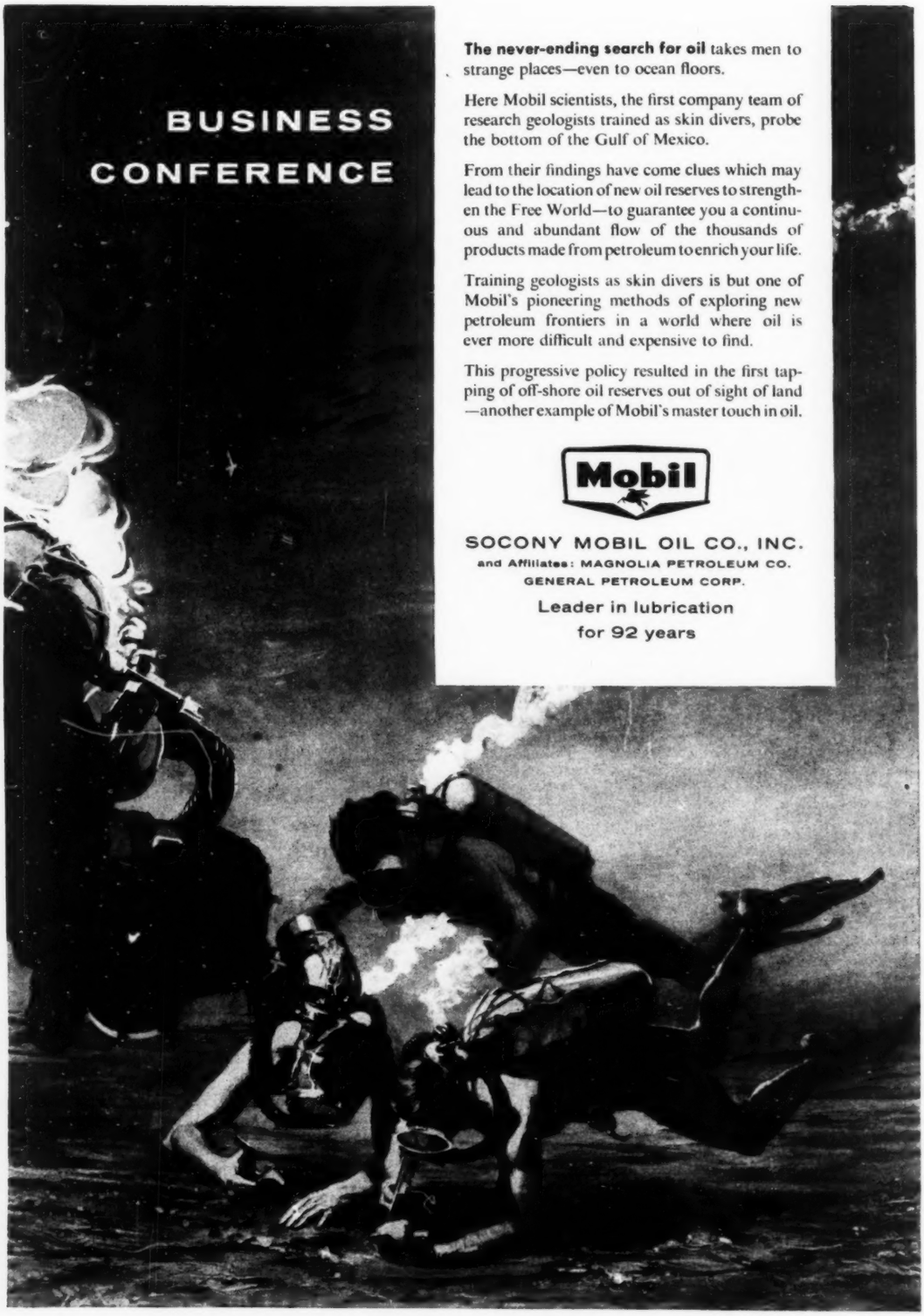
In Operation

The charge to the combination Platforming-Unifining unit—60% locally produced condensate and 40% straight-run gasoline—is prefractionated to produce a 150-400° F., 56° API heart cut. This is the liquid portion of the feed to Unifining. Excess hydrogen (from Platforming) joins this stream, is preheated, brought to reaction temperature in a fired heater, then enters the reactor and subsequently, a high pressure separator. Here any excess hydrogen is vented to the fuel gas system. The liquid product goes to a low pressure separator and thence to a stripper where the H_2S is removed overhead. The bottom product is the Platformer charge.

Our company is marketing three grades of gasoline—premium, regular and government grade. Bottoms from the prefractionator are being marketed as sand fracturing oil, which is finding increasing usage in revitalizing low producing oil wells.

Here at Famariss Oil and Refining Company we are looking into the future confident that whatever the motor fuel requirements of our customers may be we will continue to produce products meeting the highest competitive standards.


Octane number of straight run gasoline increased nearly 50% for Famariss with UOP Platforming* and UOP Unifining* processes
UNIVERSAL OIL PRODUCTS COMPANY



The never-ending search for oil takes men to strange places—even to ocean floors.

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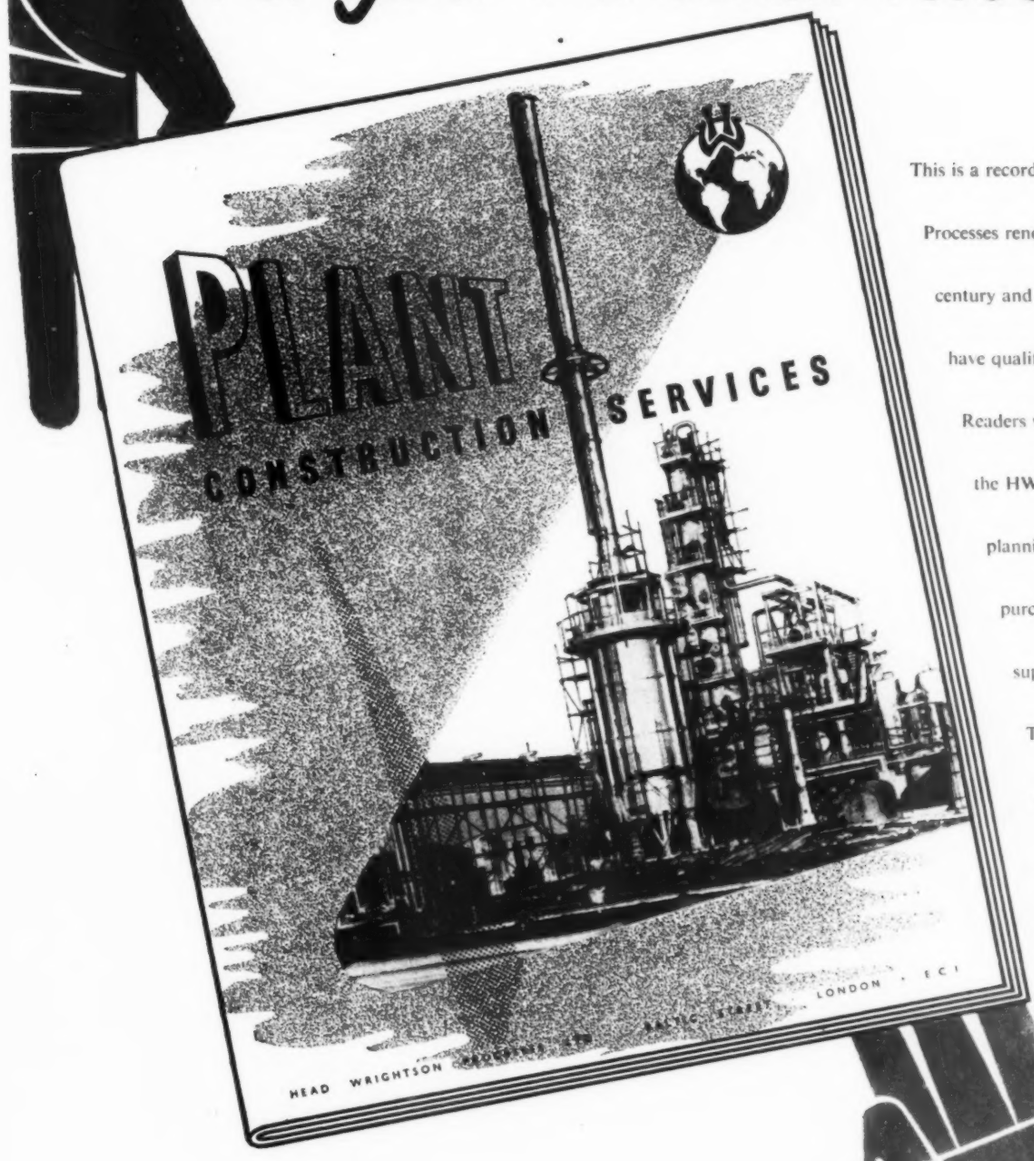

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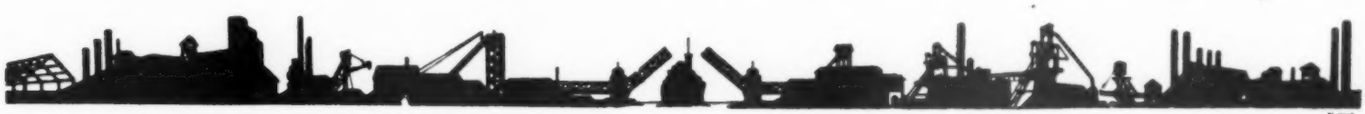

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1958 A Busy Year in International Oil

STUDENTS of the petroleum industry have observed an interesting anomaly during the past year. In the United States current producing capacity has exceeded market demand by a very wide margin. As a result state regulatory bodies have found it necessary to limit production by severe proration. In Texas, for example, wells outside the stripper class are idle more than half the time.

In the face of this situation a large number of producers who have been engaged solely in domestic operations have gone abroad to seek new oil. The growing list of those who have been traditionally domestic operators and who now have entered the international field includes both independent producers and very large integrated companies.

At the recent annual meeting of the Society of Exploration Geophysicists at Dallas the central theme of the program was "World Wide Exploration." Two general sessions were given over entirely to the problems of finding oil outside the United States and other sessions were sprinkled with papers dealing with reconnaissance in all parts of the world.

The question naturally arises as to why U.S. producers are rushing abroad when they have more oil at home than they can market readily. Clues to this may be found in papers presented at the SEG meeting and in informal discussions which took place in the hotel lobby between sessions.

Reasons for the shift in activities may be classed as both technical and economic. Technically it is becoming much more difficult to find new oil in the United States, particularly on land. Offshore in the Gulf of Mexico oil is being found and there is reason to believe that reserves to be tapped on the continental shelf are substantial. Onshore the industry has worked and reworked most favorable regions for many years. Result is that "big" oil is not being found.

T. C. Stauffer of Sun Oil Co., in his SEG paper titled "Foreign Operation for Traditionally Domestic Producing Companies" stated that "our studies show that in 1955 and 1956 the recoverable oil added to reserves per foot of well drilled in Venezuela has averaged 300 barrels compared with a United States figure of 12.6 barrels." The discovery ratio between Venezuela and the United States is thus nearly 25 to 1 on a footage basis.

While the United States appears to have a very large shut-in production there are many engineers in the industry who view the figures on producing capacity with scepticism. Despite the severe proration it is noted that the United States now is producing a greater percentage of its known reserves each year than was the case a few years ago when proration was less severe.

Since World War II there has been a revolution in well stimulation and secondary recovery methods. Particularly in the field of stimulation, producing wells return far better yields than previously. Engineers suggest, however, that the effective radius of stimulation from the borehole is somewhat limited. When the stimulated well is shut in half the time it shows a highly satisfactory potential but we do not have accurate data to indicate how long production could be maintained. Some engineers feel that a market shortage causing wells to be produced at indicated potentials would soon show a marked decline and return to about the pre-stimulation level regulated by the rate at which the oil would migrate naturally to the borehole, or be caused to flow by repressuring or flooding techniques.

Whether potentials are realistic or not the fact remains that U. S. producers are not finding new reserves as fast as oil is being produced. Reserves are being maintained only by improvements in techniques of recovery. For the long pull this means that producers feel it necessary to build reserves elsewhere. Mr. Stauffer said on this point that one reason for Sun's decision to go abroad was "the need, in the long run, to assure an adequate supply of foreign crude for our refineries against the day when it is expected that the rising demand in the United States may exceed the limits of potential domestic production."

Ignoring the domestic situation in the United States it is apparent that exploration and drilling will be at a high level in 1958. Since the close of the war demand in the Eastern Hemisphere, in Latin America and in Canada has expanded much more rapidly than in the United States and it is clear that this trend will continue in 1958. In an article elsewhere in this issue C. Marvin Case has estimated that demand for petroleum products in the Free World outside the United States will increase 9% in 1958. This is three times the rate of expansion expected in the United States itself. This is well in line with recent experience. In the past three years United States domestic demand has risen 451,000 b/d while free foreign demand has gone up 1,182,000 b/d. In 1958 it is estimated that demand in the United States will be 54% of free world demand compared with 58.5% in 1955.

It seems clear that some restriction on the importation of crude and products will be in force in the United States in 1958. But despite this barrier the international petroleum industry can view its potential market in 1958 with satisfaction and look forward to a busy year of expanding production to meet the requirements of its customers. As in the recent past the industry must continue its expansion of facilities.

A LOOK INTO OIL'S FUTURE

Free world demand (outside USA)

1957 review
1958 preview

by C. Marvin Case

MARVIN CASE, manager of the foreign petroleum economics division of Socony's economics department, is no stranger to the international petroleum industry. Prior to joining Socony Mobil in November 1945, he had spent 15 years with Jersey Standard in the South American area. From early 1943 through most of 1945, he was with the Petroleum Administration for War (PAW), in charge of foreign refinery operations, as PAW refining liaison with various wartime industry committees such as the Caribbean Area Petroleum Committee and the Foreign Operations Committee, and as USA foreign refining representative on the Allied Petroleum Planning Group.

In 1951 and 1952, during the Iranian crisis, he was loaned out by Socony to serve in a double-barreled capacity as assistant executive secretary to the Foreign Petroleum Supply Committee, and as secretary of the Supply and Distribution Subcommittee of that group.

When the Suez crisis broke, it was no surprise to find him appointed chairman of the key Supply and Distribution Subcommittee of the Middle East Emergency Committee, in which capacity he served until the dissolution of MEEC in June of 1957. This was the subcommittee which carried the main responsibility during the Suez emergency.

Introduction: In appraising 1957 petroleum demand for the Free World outside the United States, and attempting to judge the demand for 1958, the petroleum forecaster faces something more than the usual difficulties in this field which have come to be expected as almost "routine."

A few of the more important aspects (and this list is not an attempt to define the order of importance) which must be considered:

The Suez Canal was out of service during the entire first quarter of 1957, and only a token volume began to flow again through this channel in April, with full capacity available from May onward.

The Iraq Petroleum Co. pipelines to the Mediterranean were out during most of the first quarter, resumed at about 40% of capacity in mid-March, and are not expected to be back at pre-Suez capacity before the early part of 1958.

Rationing restrictions, limited storage, a tight tanker situation, price and tax increases, and warmer-than-normal weather combined to reduce European consumption during the early months of 1957.

The unsettled political situation in the Middle East and in North Africa.

Some indications of a leveling-off or perhaps a downturn in United States economic activity, with its implications on the economy of the rest of the free world.

Continuing balance of payments difficulties in many parts of the world.

General Assumptions: It has been necessary, therefore, to predicate this forecast upon certain assumptions, and it should be kept in mind that all predictions have been made within the framework of these assumptions: *

No major political or military upheavals will occur during the balance of 1957 and through 1958.

Political ferment in evidence today in the

**This article was written during October 1957, and represents the author's views as of that time.*

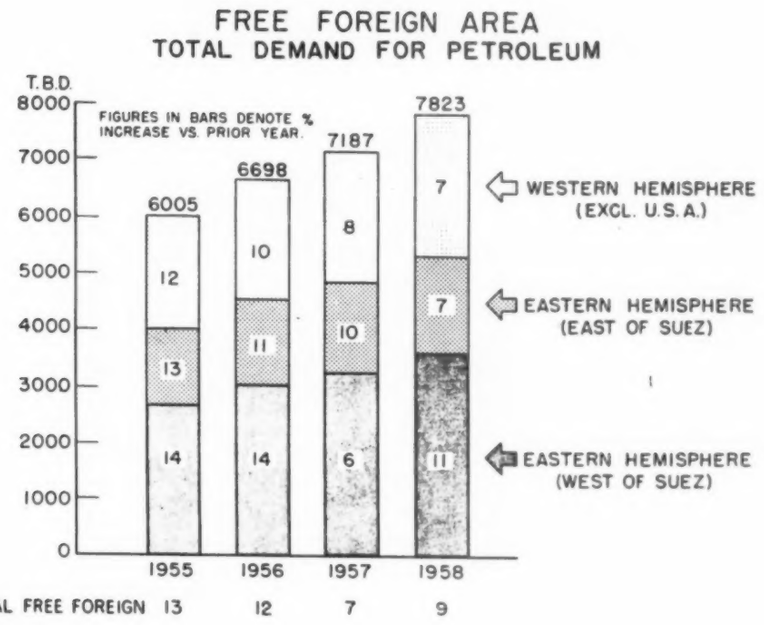

Chart # 1.

Middle East and in North Africa will remain localized.

While some leveling-off of activity in the United States is assumed, it is not expected that the magnitude of these adjustments will be such as to cause serious adjustments in Europe. It is recognized, however, that a sharp or persistent drop in United States activity, after some time lag, would communicate itself to Europe.

It has been assumed that balance-of-payments difficulties, while prevalent in many different parts of the free world, will not cause far-reaching economic upsets affecting critically the course of world economic development. Such an assumption, however, does not preclude by any means specific and possibly drastic changes within the economies of individual countries.

It has been assumed that normal weather will prevail and normal seasonal patterns of consumption will result.

It is recognized that attention is being given in Europe to a possible emergency stock-building program—involving an investment currently reported to be in the neighborhood of $600 million—to provide by 1960 an extra four weeks' storage capacity and the oil to fill it. It has been assumed that, even if any such stock-building program were to be adopted in 1957 or early in 1958, there would be little likelihood of the demand for oil in 1958 being affected to any great extent, due to the time required to build such new storage facilities.

Overall Outlook: Chart I shows the estimated total local demand for petroleum in the Free World (excl. USA) and for each of its three major subdivisions. Table I further details the growth of demand for the three major product categories of automotive gasolines, distillate fuels, and residual fuels. Data for 1955 and 1956 have been included for comparison purposes.

The effect of the Suez emergency during the first quarter of 1957 on total free-world demand outside the USA is reflected in the overall 7% growth rate anticipated for 1957 vs. 1956. Had there been no emergency, it is quite likely that the high rate of growth observed since 1947 in Europe would have continued through 1957 at about 12% to 13% over 1956, and the total demand outside the USA would have been 9% to 10% instead of the 7% now expected.

It is readily noticeable, however, by reference to Chart I, that a slowing down in the annual percentage growth rate in total demand has been the rule since 1955. This percentage slowdown is indicated to continue through 1958, although volume increases in demand are relatively large—even after allowance for the depressed 1957 first quarter in Europe occasioned by the Suez crisis.

Western Hemisphere (Excluding USA): The pattern of the Central and South American economy since the end of World War II has been one of irregular, sporadic, but essentially dynamic growth. Economic activity in the area, however, has been adversely affected by the decline in the prices of major export commodities in 1957, and Latin America's gross national product in real terms is expected to increase at the reduced rate of approximately 2% to 2½% in 1958. Problems of inflation and availability of foreign exchange also will continue. The minor slowdown in the growth rate for petroleum demand reflects these economic difficulties. Argentina and Brazil, the two largest importers of oil—both having payment difficulties—are examples of the dampening effect of lack of foreign exchange on petroleum demand.

In Canada, 1957 has seen a leveling-off in economic activity, and trends through 1958 are expected to approximate those of the United States. Agricultural exports are feeling the effect of the United States surplus disposal program, and industrial production during 1957 has declined in several major sectors. Demand for oil in Canada also is beginning to experience competition from natural gas.

The pattern of petroleum demand in the Western Hemisphere outside the United States has undergone very little change since 1955, as indicated by the following breakdown of the "consumption barrel":

WESTERN HEMISPHERE CONSUMPTION (OUTSIDE USA) 1955-1958

	% of Total			
			Estimated	
	1955	*1956*	*1957*	*1958*
Automotive gasolines	26	26	26	26
Distillate fuels (excl. kerosine)	18	18	19	19
Residual fuels	33	33	32	32
All other products	23	23	23	23
	100	100	100	100

The only significant change is that distillate fuel demand is increasing at a slightly more rapid pace than demand for the other two major products, apparently at the expense of residual fuels. This is the result of several factors, notable among which are:

Dieselization of railroads as part of the modernization programs undertaken by several countries.

Expansion of light processing industries which are, in the main, users of distillate fuels.

Diesel installations, as main equipment for thermal-electric, or "stand-by" equipment at hydro electric power plants.

Increased coastwise and international bunkering requirements for diesel oils.

Eastern Hemisphere—East of Suez: In this area there was no noticeable effect on

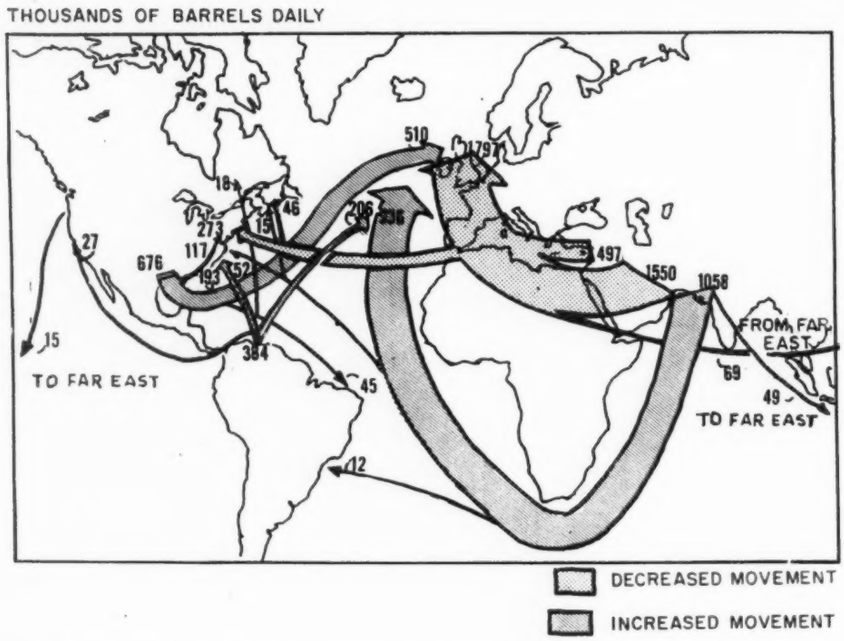

Chart II—Net Changes in Petroleum Movements out of Major Producing Areas; Pre-Suez vs. Main Crisis Period.

petroleum demand during the Suez emergency, except that which was the natural result of the increased cost of oil and the tight world transportation situation. Demand growth in 1957 is expected to be off slightly from the unusually high rates of growth experienced during 1955 and 1956.

For 1958, the Middle East presents a picture of slow economic expansion—even assuming political equilibrium is maintained in the area. In most countries of the Middle East, industrial output and the volume of trade (excluding petroleum) are not foreseen to change significantly in 1958; but it is expected that many of these countries will continue to have financial difficulties.

In other countries east of Suez—notably India, Pakistan, and Japan—inflation, coupled with foreign-trade imbalances and lack of hard currency, will continue to be the rule rather than the exception during 1958. These things are not new, but persistently have grown worse, and are believed to be responsible in large part for the falling off in the percentage rate of growth of petroleum demand from the high levels of recent years.

Demand for gasoline maintains a fairly steady growth pattern—1958 being estimated at about 7% over 1957, which compares favorably with the 1955-56 rate. Distillate fuels have been moving ahead at a relatively fast pace, and some slowdown of this rate is foreseen for 1958. Residual fuels in general follow the same pattern as distillates, but the volume is much larger, and consequently it has an important "weighting" effect on total demand for all products.

The composition of the "consumption barrel" in the Eastern Hemisphere—east of Suez—appears likely to show little change in 1958:

CONSUMPTION EAST OF SUEZ 1955-58

	% of Total			
				Estimated
	1955	*1956*	*1957*	*1958*
Automotive gasolines	22	22	21	21
Distillate fuels (excl. kerosine)	16	16	16	16
Residual fuels	37	37	37	37
All other products	25	25	26	26
	100	100	100	100

Of particular importance, however, is the amount of oil required for fueling the refineries in this area—particularly the heavy concentration of refineries in the Persian Gulf, and the several new refineries in the area which have started operation recently. This item alone now accounts for about one-half the total "all other products," or a little over 10% of total demand.

Eastern Hemisphere—West of Suez: This was the area mainly affected by the Suez emergency. When the stoppage of the Suez Canal and Iraq Petroleum Co., pipelines to the Mediterranean removed over two million barrels daily from the stream of oil flowing westward (mainly to Europe), the main problem facing the industry was the readjustment of transportation facilities to offset the loss of these two major arteries, and thus avoid a critical breakdown of the European economy.

The cutoff of these supply routes created no physical loss of oil—oil was still available in the Middle East if transportation could be found to move it. But, for every barrel of Middle East oil taken around the Cape to Europe, two barrels could be delivered from Western Hemisphere sources using the same amount of tanker tonnage. Therefore, the crux of the problem was to find the most efficient balance between Western Hemisphere oil availability, on the one hand, and limited tanker availability on the other. This was the task undertaken by the Middle East Emergency Committee (MEEC) in cooperation with the OEEC Petroleum Emergency Group (OPEG). Rationing programs were instituted by European governments to reduce the requirements for oil to the bare minimum, and thus make maximum use of available

TABLE I

FREE WORLD (OUTSIDE USA)
TOTAL LOCAL DEMAND FOR PETROLEUM

	Actual 1955		Preliminary 1956		Estimated 1957		Estimated 1958	
	TBD	Incr.*	TBD	Incr.*	TBD	Incr.*	TBD	Incr.*
Automotive Gasolines								
West. Hem. (Excl. USA)	518	9	557	8	604	8	650	8
East. Hem.—E. of Suez	290	8	311	7	339	9	361	7
East. Hem.—W. of Suez	575	9	617	7	637	3	697	9
Total	1,383	9	1,485	7	1,580	6	1,708	7
Distillate Fuels (Excl. Kero.)								
West. Hem. (Excl. USA)	343	19	390	14	435	12	465	7
East. Hem.—E. of Suez	212	12	234	10	259	11	278	7
East. Hem.—W. of Suez	581	19	682	17	741	9	824	12
Total	1,136	17	1,306	15	1,435	10	1,567	9
Residual Fuels (Excl. Refinery Fuel)								
West. Hem. (Excl. USA)	661	11	728	10	772	6	812	5
East. Hem.—E. of Suez	484	8	538	11	594	10	630	6
East. Hem.—W. of Suez	929	17	1,079	16	1,158	7	1,315	14
Total	2,074	13	2,345	13	2,534	8	2,757	8
Total All Products**								
West. Hem. (Excl. USA)	1,977	12	2,175	10	2,344	8	2,500	7
East. Hem.—E. of Suez	1,312	13	1,450	11	1,594	10	1,709	7
East. Hem.—W. of Suez	2,716	14	3,073	14	3,249	6	3,614	11
Total	6,005	13	6,698	12	7,187	7	7,823	9

*% Increase vs. previous year.
**Includes three major categories shown in detail, plus all other demand for petroleum products including refinery fuel.

tanker tonnage; even the weather cooperated as Europe experienced its warmest winter in many years—reducing the need for oil for heating purposes.

How well the job was done is illustrated by chart II—which shows the net change in oil flow during the main crisis period November 1, 1956 to March 31, 1957. The result was to maintain supplies to the affected area during this period at about 90% of the pre-Suez normal.

Any appraisal of the petroleum outlook for the Eastern Hemisphere—West of Suez must be taken in the light of what has been happening to the general economies of these nations since the end of World War II. The entire postwar period, and most particularly the years after 1950, have been characterized by a tremendous industrial and trade expansion, particularly in the heavy industrialized OEEC area.

A peak was reached in 1955, and since that year European economies have continued to expand at a slower but, nonetheless, substantial rate. Gross national product in constant prices, capital investment, private consumption, industrial production, and foreign trade are expected to grow in 1958—but at a slower rate than has been evidenced for 1957. Industrial production, for example, in 1957 should register about a 6% increase over 1956, but the increase in 1958 at this juncture seems to be headed for about 5% or slightly less. Overall export volume is estimated to show an expansion of 8% in 1957 and a further expansion of 7% in 1958. Likewise, total imports should show a 7% increase in 1957, and about 6% in 1958. Intra-European trade is on the upgrade, but it is too early to assume that the persistent problem of imbalance in intra-European accounts is ended—particularly as regards France.

In respect to the general economic outlook for 1958 in the Eastern Hemisphere—west of Suez—it appears desirable at this time to inject some notes of caution:

The lower rate of overall growth envisaged for 1957 and continuing through 1958, particularly for the OEEC area of Europe, may well indicate a new trend.

Declines in gold and dollar reserves abroad may mean increasing discrimination against dollar goods and further exchange-rate adjustments.

Should adjustments in United States business activity in 1958 be sharper than anticipated, this would probably be felt in Europe later in the year and in 1959.

No attempt has been made to evaluate quantitatively the effect of these things on 1958 petroleum demand, although it is realized that they could have a dampening action on demand.

The discussion which follows with respect to the outlook for petroleum has been related, therefore, to the assumptions outlined at the beginning of this review, and should be read with those assumptions in mind.

With petroleum consumption during the early part of 1957 depressed by the emergency, the overall increase for 1957 probably will end up only about 6% above the 1956 level. For 1958, an increase of 11% above 1957 is indicated. This increase may seem high in view of events during 1957, and it requires an analysis of the demand by major-product categories to show fully the significance of this percentage increase figure. The major-product categories selected were automotive gasolines, distillate fuel oils, and residual fuel oils, which combined constitute 80% of total oil demand in the Eastern Hemisphere—west of Suez.

Automotive Gasolines: Table II shows, by half-yearly periods and annually, demand for automotive gasolines. The table demonstrates that gasoline demand was increasing in 1955 and 1956, although the rate of increase was not so fast as that observed for the total demand shown in Table V. This is due in large part to the high tax burden imposed on gasoline in most European countries. Gasoline was perhaps the product hardest hit by the Suez emergency. Rationing programs, price increases, and special taxes were largely responsible for the curtailed consumption in the first half of 1957. These measures were most severe and most effective in the United Kingdom, and in France and French North Africa. Consequently, the first half of 1957 saw gasoline consumption 2% below that of the first half of 1956; nearly all of this curtailment was concentrated in the OEEC countries of Europe.

TABLE II

EAST. HEMISPHERE—WEST OF SUEZ
LOCAL DEMAND FOR AUTOMOTIVE GASOLINES

	1st Half		2nd Half		Year	
	TBD	% Incr.*	TBD	% Incr.*	TBD	% Incr.*
1955	538	9	610	9	575	9
1956	578	7	656	8	617	7
1957	565	(2)	709E	8	637E	3
1958	649E	15	744E	5	697E	9

TABLE III

EAST. HEMISPHERE—WEST OF SUEZ
LOCAL DEMAND FOR DISTILLATE FUELS
(Excludes Kerosines)

1955	559	18	603	19	581	19
1956	646	16	718	19	682	17
1957	675	5	805E	12	741E	9
1958	797E	18	853E	6	824E	12

TABLE IV

EAST. HEMISPHERE—WEST OF SUEZ
LOCAL DEMAND FOR RESIDUAL FUELS
(Excludes Refinery Fuel)

1955	910	18	947	17	929	1.
1956	1,060	17	1,095	16	1,079	16
1957	1,073	1	1,242E	13	1,158E	7
1958	1,268E	18	1,362E	10	1,315E	14

TABLE V

EAST. HEMISPHERE—WEST OF SUEZ
LOCAL DEMAND FOR ALL PRODUCTS**

1955	2,615	15	2,815	14	2,716	14
1956	2,957	13	3,188	14	3,073	14
1957	2,980	1	3,513E	10	3,249E	6
1958	3,466E	16	3,760E	7	3,614E	11

*—% Increase vs. like period previous year.
**—Includes three major product categories shown in detail plus all other demand for petroleum products including refinery fuel.
E—Estimate.

Starting in the second quarter of 1957, gasoline demand began to show improvement as rationing restrictions were lifted and in most cases prices returned more nearly to the pre-Suez level. It is expected that this improvement will continue through the balance of 1957 and during 1958. In other words, it would appear that there will be no lasting effect of the Suez crisis on gasoline demand. This is supported by the continuing increase in motor-vehicle ownership evidenced throughout Europe, and by the increasing production of motor vehicles in Europe.

During the Suez emergency, there may have been a decrease in the number of motor vehicles in operation; but, when supplies of oil returned to normal, the use of motor vehicles again increased. In the United Kingdom, as an example, there was something more than a seasonal drop in the February 1957 registrations. However, in May the registrations reached a new high. Indications of motor-vehicle registrations point to a continuing increase. For 1958, it is expected that in the United Kingdom motor-vehicle registrations will be 6% over the 1957 level. Likewise, in France—even with a recent gasoline-tax increase in effect—motor-vehicle registrations in 1958 are forecast to be about 5% above the 1957 level. In Germany, the 1958 increase is expected to be 10% above the 1957 level. This is a high rate, and is indicative of the fact that German car ownership, which had been lagging during the early postwar years, is now catching up with the rest of Europe.

Comparing the demand estimates for gasolines for the first half of 1958 with the depressed first half of 1957, there is an indicated increase of 15%. However, the true trend in gasoline consumption perhaps is better illustrated by comparing the forecast for the latter half of 1958 with the more nearly normal second half of 1957. This increase of 5% indicates a continuation of the low percentage growth rate in gasoline as compared with the two other major product categories.

Distillate Fuels (Excluding Kerosines): From Table III it is readily apparent, by comparison with Table II, that demand for distillate fuels now exceeds in volume that for automotive gasolines in the Eastern Hemisphere—west of Suez. It is also obvious that distillate demand was moving ahead at a rapid pace percentagewise during 1955 and most of 1956.

However, the Suez emergency also forced restrictions to be applied to the inland use of distillate fuels by several European governments, with a consequent dampening of the rate growth starting toward the end of 1956 and continuing through the first half of 1957. Nevertheless, even with the Suez Canal closed and some restrictions in force for the last two months of 1956, the distillate consumption during the second half of that year was 19% over that of the like period of 1955. And—despite the re-

(continued on page 60)

1957 WORLD CRUDE OUTPUT BELOW PAR

WORLD crude production increased 6.8% during 1957 but that was below par, if 1956 increase is taken as an example. In that year it increased 7.2%. The difference is, of course, explained by the Suez Crisis and the decline in Europe's consumption, partially accounted for by a slowing-down of the industrial boom. United States consumption was also below expectations during 1957.

The year's end figures show little abnormality; despite the Suez crisis the long-term trends continued. As concerns the principal countries, the United States continued its downward trend in percentage of world production. It has dropped about 4 percent in the last two years, now is only 40.4% of world supply. Canada continued a gradual increase but at the year's end her production dropped when stringent prorationing was increased. Venezuela continued to increase both relatively and absolutely. Her quarterly figures show production dropping back from the boom at the first and middle of the year when Suez oil flow was stopped and Europe depended on Venezuela for supplies. Mexico stayed about the same in absolute terms, but lost ground relatively as the remainder of the world generally increased.

WORLD CRUDE PRODUCTION

(Thousands of Barrels Daily)

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1957 Year	1956 Year
United States	7,626.3	7,363.3	6,827.0	6,898.3	7,178.7	7,151.0
Canada	529.3	527.1	502.6	475.0	508.5	462.6
Mexico	255.3	243.6	247.1	252.0	249.5	257.1
Total North America	8,410.9	8,134.0	7,576.7	7,625.3	7,936.7	7,870.7
Argentina	92.6	90.8	91.9	91.9	92.0	85.1
Bolivia	9.7	9.6	9.8	10.2	9.8	8.8
Brazil	24.7	19.7	24.8	32.5	25.4	11.1
Chile	10.8	11.3	11.9	11.2	11.3	9.5
Colombia	120.8	122.1	121.6	122.2	121.7	120.4
Cuba	1.1	1.0	1.0	.9	1.0	1.2
Ecuador	8.4	8.5	9.0	8.8	8.7	9.8
Peru	51.7	53.0	53.0	53.1	52.7	49.9
Trinidad	87.5	94.3	95.6	97.5	93.7	79.0
Venezuela	2,855.4	2,942.7	2,748.6	2,675.3	2,805.5	2,456.8
Total S. America & Caribbean	3,263.2	3,353.0	3,175.2	3,102.3	3,241.8	2,831.7
Total Western Hemisphere	11,674.1	11,487.0	10,743.9	10,728.9	11,158.5	10,702.4
Algeria	.4	.3	.2	.2	.3	.7
Austria	61.2	63.4	58.8	67.0	60.1	63.7
France	28.5	28.4	27.5	27.5	28.0	24.1
Gabon	.9	3.8	3.5	5.0	3.3	6.0
Morocco	1.6	1.6	1.6	1.5	1.6	2.0
Germany (Western)	73.1	76.0	78.4	79.5	76.8	68.5
Italy & Sicily	19.3	26.8	31.8	32.5	27.6	11.5
Netherlands	27.1	28.5	28.8	32.0	29.1	20.6
United Kingdom	1.7	1.7	1.7	1.7	1.7	1.3
Total W. Europe & No. Africa (incl. Turk)	213.8	230.5	232.3	232.4	228.5	192.4
Others	6.0	6.0	6.0	6.1	3.6	6.0

Rationing restrictions, limited storage, a tight tanker situation, price and tax increases, and warmer-than-normal weather combined to reduce European consumption during the early months of 1957.

The unsettled political situation in the Middle East and in North Africa.

Some indications of a leveling-off or perhaps a downturn in United States economic activity, with its implications on the economy of the rest of the free world.

Continuing balance of payments difficulties in many parts of the world.

In the Middle East only one country, Iran, had a gain in relative position over last year's. The others increased their production slightly over last year, but either stayed the same or lost ground. Iraq was (and is) particularly hard hit. Her share of the world's output of crude dropped sharply to 2.3% from 3.9% last year. The pipelines are now in the last stages of repair, still Iraq has a difficult time increasing production.

The first drops of oil from the Sahara reached the Mediterranean, too late to make a total large enough to raise Algeria's extremely low level, but a forerunner of what is to come. This area will become one of the world's major producers, political conditions willing. The geology of the area makes it unlikely that discoveries made there at

1958 preview

Introduction: In appraising 1957 petroleum demand for the Free World outside the United States, and attempting to judge the demand for 1958, the petroleum forecaster faces something more than the usual difficulties in this field which have come to be expected as almost "routine."

A few of the more important aspects (and this list is not an attempt to define the order of importance) which must be considered:

The Suez Canal was out of service during the entire first quarter of 1957, and only a token volume began to flow again through this channel in April, with full capacity available from May onward.

The Iraq Petroleum Co. pipelines to the Mediterranean were out during most of the first quarter, resumed at about 40% of capacity in mid-March, and are not expected to be back at pre-Suez capacity before the early part of 1958.

by C. Marvin Case

MARVIN CASE, manager of the foreign petroleum economics division of Socony's economics department, is no stranger to the international petroleum industry. Prior to joining Socony Mobil in November 1945, he had spent 15 years with Jersey Standard in the South American area. From early 1943 through most of 1945, he was with the Petroleum Administration for War

Refrigerated propane tankers to be built in Italy

by A. M. Stahmer

DOMENICO MARCIANO, the Italian "scrap king," is building a shipyard in Livorno, Italy, destined exclusively for the construction of oil and LPGas tankers through the cooperation of the American shipping firm Marine Transport Lines Inc., New York.

The Livorno project was originated by the wish of Marine Transport Lines to build three 46,000 dwt oil tankers in Europe and to examine at the same time the possibilities for gas transportation from the Persian Gulf to Europe. When it was found that the order books of all shipyards in the northern countries were complete up to 1962 and even 1963, Marine Transport Lines contacted Domenico Marciano who, as owner of the largest private Italian scrap yard in La Spezia (where some of the most famous Italian battleships were scrapped), has high-quality steel for the production of ship plates at his disposal.

Marciano decided to build a new tanker yard in Livorno, and for this purpose bought a 200,000- square-meter site on an industrial canal. Work was begun last March, and

workshops in pieces up to 80 tons, and will be joined together on the building site. The total building costs for the yard are figured at $9 million, which is less than the presumable price for the first tanker to be built. Delivery of the first vessel is forecast for mid-1959. The second vessel is expected to be completed in September 1959, to be followed by two further tankers in December 1959 and January 1960.

The new Livorno yard is operated by Conditioned Power Co., Rome, which is 70% owned by Domenico Marciano, Chairman and partner is Admiral Angelo Parona.

As mentioned above, the building program comprises two types of vessels: normal oil tankers of 46,000 dwt up to 100,000 dwt, and propane gas tankers. As regards the oil tankers, it is planned to build only the hulls in Livorno and to tow them through Gibraltar and the English Channel to the Rawaldtwerke, Harsburg, where the vessels are to be fitted with German turbines, boilers, etc. This project opens an aspect of cooperation between the North [illegible] developed industry

is to be separated in the Arabian fields from natural gas. Loading the tankers will create a propane temperature rise of only 5° C. During the sea voyage under normal pressure, the liquefied propane will suffer a daily loss through evaporation of about 0.55%, which is to be reliquefied by a special compressor plant on board the ship. On discharge of the vessel, about 2% of the propane will remain in the tanks in order to prevent a rise in temperature in the loading tanks on the ballast trip.

The gas tankers will be equipped with General Electric turbines of 16,000 hp, which will give the vessels a cruising speed of 17 knots. Measurements of the vessels will correspond more or less to those of the 47,000 dwt tankers (length between perpendiculars, 763 ft 3 in.; breadth, moulded, 102 ft; draft design, 36 ft). Building cost of the new LPGas tanker developed in Livorno, as against pressure LPGas tankers now in operation, will be about half. Building costs will range between $300 and $600 per ton LPGas loading capacity and $200 per ton oil-tank space.

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main localized.

While some leveling-off of activity in the United States is assumed, it is not expected that the magnitude of these adjustments will be such as to cause serious adjustments in Europe. It is recognized, however, that a sharp or persistent drop in United States activity, after some time lag, would communicate itself to Europe.

It has been assumed that balance-of-payments difficulties, while prevalent in many different parts of the free world, will not cause far-reaching economic upsets affecting critically the course of world economic development. Such an assumption, however, does not preclude by any means specific and possibly drastic changes within the economies of individual countries.

It has been assumed that normal weather will prevail and normal seasonal patterns of consumption will result.

It is recognized that attention is being given in Europe to a possible emergency stock-building program—involving an investment currently reported to be in the neighborhood of $600 million—to provide by 1960 an extra four weeks' storage capacity and the oil to fill it. It has been assumed that, even if any such stock-building program were to be adopted in 1957 or early in 1958, there would be little likelihood of the demand for oil in 1958 being affected to any great extent, due to the time required to build such new storage facilities.

overall 7% growth rate anticipated for 1957 vs. 1956. Had there been no emergency, it is quite likely that the high rate of growth observed since 1947 in Europe would have continued through 1957 at about 12% to 13% over 1956, and the total demand outside the USA would have been 9% to 10% instead of the 7% now expected.

It is readily noticeable, however, by reference to Chart I, that a slowing down in the annual percentage growth rate in total demand has been the rule since 1955. This percentage slowdown is indicated to continue through 1958, although volume increases in demand are relatively large—even after allowance for the depressed 1957 first quarter in Europe occasioned by the Suez crisis.

Western Hemisphere (Excluding USA): The pattern of the Central and South American economy since the end of World War II has been one of irregular, sporadic, but essentially dynamic growth. Economic activity in the area, however, has been adversely affected by the decline in the prices of major export commodities in 1957, and Latin America's gross national product in real terms is expected to increase at the reduced rate of approximately 2% to 2½% in 1958. Problems of inflation and availa-

plus disposal program, and industrial production during 1957 has declined in several major sectors. Demand for oil in Canada also is beginning to experience competition from natural gas.

The pattern of petroleum demand in the Western Hemisphere outside the United States has undergone very little change since 1955, as indicated by the following breakdown of the "consumption barrel":

WESTERN HEMISPHERE CONSUMPTION (OUTSIDE USA) 1955-1958

	% of Total			
			Estimated	
	1955	*1956*	*1957*	*1958*
Automotive gasolines	26	26	26	26
Distillate fuels (excl. kerosine)	18	18	19	19
Residual fuels	33	33	32	32
All other products	23	23	23	23
	100	100	100	100

The only significant change is that distillate fuel demand is increasing at a slightly more rapid pace than demand for the other two major products, apparently at the expense of residual fuels. This is the result of several factors, notable among which

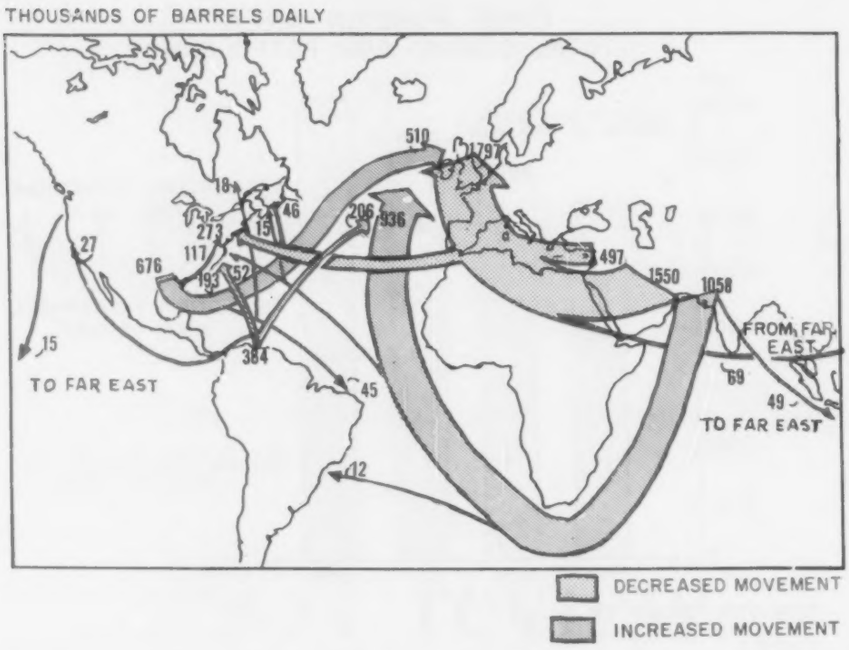


Chart II—Net Changes in Petroleum Movements out of Major Producing Areas; Pre-Suez vs. Main Crisis Period.

petroleum demand during the Suez emergency, except that which was the natural result of the increased cost of oil and the tight world transportation situation. Demand growth in 1957 is expected to be off slightly from the unusually high rates of growth experienced during 1955 and 1956.

For 1958, the Middle East presents a picture of slow economic expansion—even assuming political equilibrium is maintained in the area. In most countries of the Middle East, industrial output and the volume of trade (excluding petroleum) are not foreseen to change significantly in 1958; but it is expected that many of these countries will continue to have financial difficulties.

In other countries east of Suez—notably India, Pakistan, and Japan—inflation coupled with foreign-trade imbalances and lack of hard currency, will continue to be the rule rather than the exception during 1958. These things are not new, but persistently have grown worse, and are believed to be responsible in large part for the falling off in the percentage rate of growth of petroleum demand from the high levels of recent years.

Demand for gasoline maintains a fairly steady growth pattern—1958 being estimated at about 7% over 1957, which compares favorably with the 1955-56 rate. Distillate fuels have been moving ahead at a relatively fast pace, and some slowdown of this rate is foreseen for 1958. Residual fuels in general follow the same pattern as distillates, but the volume is much larger, and consequently it has an important "weighting" effect on total demand for all products.

The composition of the "consumption barrel" in the Eastern Hemisphere—east of Suez—appears likely to show little change in 1958:

CONSUMPTION EAST OF SUEZ 1955-58

	% of Total			
				Estimated
	1955	*1956*	*1957*	*1958*
Automotive gasolines	22	22	21	21
Distillate fuels (excl. kerosine)	16	16	16	16
Residual fuels	37	37	37	37
All other products	25	25	26	26
	100	100	100	100

Of particular importance, however, is the amount of oil required for fueling the refineries in this area—particularly the heavy concentration of refineries in the Persian Gulf, and the several new refineries in the area which have started operation recently. This item alone now accounts for about one-half the total "all other products," or a little over 10% of total demand.

Eastern Hemisphere—West of Suez: This was the area mainly affected by the Suez emergency. When the stoppage of the Suez Canal and Iraq Petroleum Co., pipelines to the Mediterranean removed over two million barrels daily from the stream of oil flowing westward (mainly to Europe), the main problem facing the industry was the readjustment of transportation facilities to offset the loss of these two major arteries, and thus avoid a critical breakdown of the European economy.

The cutoff of these supply routes created no physical loss of oil—oil was still available in the Middle East if transportation could be found to move it. But, for every barrel of Middle East oil taken around the Cape to Europe, two barrels could be delivered from Western Hemisphere sources using the same amount of tanker tonnage. Therefore, the crux of the problem was to find the most efficient balance between Western Hemisphere oil availability, on the one hand, and limited tanker availability on the other. This was the task undertaken by the Middle East Emergency Committee (MEEC) in cooperation with the OEEC Petroleum Emergency Group (OPEG). Rationing programs were instituted by European governments to reduce the requirements for oil to the bare minimum, and thus make maximum use of available

TABLE I

FREE WORLD (OUTSIDE USA)
TOTAL LOCAL DEMAND FOR PETROLEUM

	Actual 1955		Preliminary 1956		Estimated 1957		1958	
	TBD	Incr.*	TBD	Incr.*	TBD	Incr.*	TBD	Incr.*
Automotive Gasolines								
West. Hem. (Excl. USA)	518	9	557	8	604	8	650	8
East. Hem.—E. of Suez	290	8	311	7	339	9	361	7
East. Hem.—W. of Suez	575	9	617	7	637	3	697	9
Total	1,383	9	1,485	7	1,580	6	1,708	7
Distillate Fuels (Excl. Kero.)								
West. Hem. (Excl. USA)	343	19	390	14	435	12	465	7
East. Hem.—E. of Suez	212	12	234	10	259	11	278	7
East. Hem.—W. of Suez	581	19	682	17	741	9	824	12
Total	1,136	17	1,306	15	1,435	10	1,567	9
Residual Fuels (Excl. Refinery Fuel)								
West. Hem. (Excl. USA)	661	11	728	10	772	6	812	5
East. Hem.—E. of Suez	484	8	538	11	594	10	630	6
East. Hem.—W. of Suez	929	17	1,079	16	1,158	7	1,315	14
Total	2,074	13	2,345	13	2,534	8	2,757	8
Total All Products**								
West. Hem. (Excl. USA)	1,977	12	2,175	10	2,344	8	2,500	7
East. Hem.—E. of Suez	1,312	13	1,450	11	1,594	10	1,709	7
East. Hem.—W. of Suez	2,716	14	3,073	14	3,249	6	3,614	11
Total	6,005	13	6,698	12	7,187	7	7,823	9

*% Increase vs. previous year.
**Includes three major categories shown in detail, plus all other demand for petroleum products including refinery fuel.

tanker tonnage; even the weather cooperated as Europe experienced its warmest winter in many years—reducing the need for oil for heating purposes.

How well the job was done is illustrated by chart II—which shows the net change in oil flow during the main crisis period November 1, 1956 to March 31, 1957. The result was to maintain supplies to the affected area during this period at about 90% of the pre-Suez normal.

Any appraisal of the petroleum outlook for the Eastern Hemisphere—West of Suez must be taken in the light of what has been happening to the general economies of these nations since the end of World War II. The entire postwar period, and most particularly the years after 1950, have been characterized by a tremendous industrial and trade expansion, particularly in the heavy industrialized OEEC area.

A peak was reached in 1955, and since that year European economies have continued to expand at a slower but, nonetheless, substantial rate. Gross national product in constant prices, capital investment, private consumption, industrial production, and foreign trade are expected to grow in 1958—but at a slower rate than has been evidenced for 1957. Industrial production, for example, in 1957 should register about a 6% increase over 1956, but the increase in 1958 at this juncture seems to be headed for about 5% or slightly less. Overall export volume is estimated to show an expansion of 8% in 1957 and a further expansion of 7% in 1958. Likewise, total imports should show a 7% increase in 1957, and about 6% in 1958. Intra-European trade is on the upgrade, but it is too early to assume that the persistent problem of imbalance in intra-European accounts is ended—particularly as regards France.

In respect to the general economic outlook for 1958 in the Eastern Hemisphere—west of Suez—it appears desirable at this time to inject some notes of caution:

The lower rate of overall growth envisaged for 1957 and continuing through 1958, particularly for the OEEC area of Europe, may well indicate a new trend.

Declines in gold and dollar reserves abroad may mean increasing discrimination against dollar goods and further exchange-rate adjustments.

Should adjustments in United States business activity in 1958 be sharper than anticipated, this would probably be felt in Europe later in the year and in 1959.

No attempt has been made to evaluate quantitatively the effect of these things on 1958 petroleum demand, although it is realized that they could have a dampening action on demand.

The discussion which follows with respect to the outlook for petroleum has been related, therefore, to the assumptions outlined at the beginning of this review, and should be read with those assumptions in mind.

With petroleum consumption during the early part of 1957 depressed by the emergency, the overall increase for 1957 probably will end up only about 6% above the 1956 level. For 1958, an increase of 11% above 1957 is indicated. This increase may seem high in view of events during 1957, and it requires an analysis of the demand by major-product categories to show fully the significance of this percentage increase figure. The major-product categories selected were automotive gasolines, distillate fuel oils, and residual fuel oils, which combined constitute 80% of total oil demand in the Eastern Hemisphere—west of Suez.

Automotive Gasolines: Table II shows, by half-yearly periods and annually, demand for automotive gasolines. The table demonstrates that gasoline demand was increasing in 1955 and 1956, although the rate of increase was not so fast as that observed for the total demand shown in Table V. This is due in large part to the high tax burden imposed on gasoline in most European countries. Gasoline was perhaps the product hardest hit by the Suez emergency. Rationing programs, price increases, and special taxes were largely responsible for the curtailed consumption in the first half of 1957. These measures were most severe and most effective in the United Kingdom, and in France and French North Africa. Consequently, the first half of 1957 saw gasoline consumption 2% below that of the first half of 1956; nearly all of this curtailment was concentrated in the OEEC countries of Europe.

TABLE II

EAST. HEMISPHERE—WEST OF SUEZ
LOCAL DEMAND FOR AUTOMOTIVE GASOLINES

	1st Half		2nd Half		Year	
	TBD	% Incr.*	TBD	% Incr.*	TBD	% Incr.*
1955	538	9	610	9	575	9
1956	578	7	656	8	617	7
1957	565	(2)	709E	8	637E	3
1958	649E	15	744E	5	697E	9

TABLE III

EAST. HEMISPHERE—WEST OF SUEZ
LOCAL DEMAND FOR DISTILLATE FUELS
(Excludes Kerosines)

1955	559	18	603	19	581	19
1956	646	16	718	19	682	17
1957	675	5	805E	12	741E	9
1958	797E	18	853E	6	824E	12

TABLE IV

EAST. HEMISPHERE—WEST OF SUEZ
LOCAL DEMAND FOR RESIDUAL FUELS
(Excludes Refinery Fuel)

1955	910	18	947	17	929	1.
1956	1,060	17	1,095	16	1,079	16
1957	1,073	1	1,242E	13	1,158E	7
1958	1,268E	18	1,362E	10	1,315E	14

TABLE V

EAST. HEMISPHERE—WEST OF SUEZ
LOCAL DEMAND FOR ALL PRODUCTS**

1955	2,615	15	2,815	14	2,716	14
1956	2,957	13	3,188	14	3,073	14
1957	2,980	1	3,513E	10	3,249E	6
1958	3,466E	16	3,760E	7	3,614E	11

*—% Increase vs. like period previous year.
**—Includes three major product categories shown in detail plus all other demand for petroleum products including refinery fuel.
E—Estimate.

Starting in the second quarter of 1957, gasoline demand began to show improvement as rationing restrictions were lifted and in most cases prices returned more nearly to the pre-Suez level. It is expected that this improvement will continue through the balance of 1957 and during 1958. In other words, it would appear that there will be no lasting effect of the Suez crisis on gasoline demand. This is supported by the continuing increase in motor-vehicle ownership evidenced throughout Europe, and by the increasing production of motor vehicles in Europe.

During the Suez emergency, there may have been a decrease in the number of motor vehicles in operation; but, when supplies of oil returned to normal, the use of motor vehicles again increased. In the United Kingdom, as an example, there was something more than a seasonal drop in the February 1957 registrations. However, in May the registrations reached a new high. Indications of motor-vehicle registrations point to a continuing increase. For 1958, it is expected that in the United Kingdom motor-vehicle registrations will be 6% over the 1957 level. Likewise, in France—even with a recent gasoline-tax increase in effect—motor-vehicle registrations in 1958 are forecast to be about 5% above the 1957 level. In Germany, the 1958 increase is expected to be 10% above the 1957 level. This is a high rate, and is indicative of the fact that German car ownership, which had been lagging during the early postwar years, is now catching up with the rest of Europe.

Comparing the demand estimates for gasolines for the first half of 1958 with the depressed first half of 1957, there is an indicated increase of 15%. However, the true trend in gasoline consumption perhaps is better illustrated by comparing the forecast for the latter half of 1958 with the more nearly normal second half of 1957. This increase of 5% indicates a continuation of the low percentage growth rate in gasoline as compared with the two other major product categories.

Distillate Fuels (Excluding Kerosines): From Table III it is readily apparent, by comparison with Table II, that demand for distillate fuels now exceeds in volume that for automotive gasolines in the Eastern Hemisphere—west of Suez. It is also obvious that distillate demand was moving ahead at a rapid pace percentagewise during 1955 and most of 1956.

However, the Suez emergency also forced restrictions to be applied to the inland use of distillate fuels by several European governments, with a consequent dampening of the rate growth starting toward the end of 1956 and continuing through the first half of 1957. Nevertheless, even with the Suez Canal closed and some restrictions in force for the last two months of 1956, the distillate consumption during the second half of that year was 19% over that of the like period of 1955. And—despite the re-

(continued on page 60)

1957 WORLD CRUDE OUTPUT BELOW PAR

WORLD crude production increased 6.8% during 1957 but that was below par, if 1956 increase is taken as an example. In that year it increased 7.2%. The difference is, of course, explained by the Suez Crisis and the decline in Europe's consumption, partially accounted for by a slowing-down of the industrial boom. United States consumption was also below expectations during 1957.

The year's end figures show little abnormality; despite the Suez crisis the long-term trends continued. As concerns the principal countries, the United States continued its downward trend in percentage of world production. It has dropped about 4 percent in the last two years, now is only 40.4% of world supply. Canada continued a gradual increase but at the year's end her production dropped when stringent prorationing was increased. Venezuela continued to increase both relatively and absolutely. Her quarterly figures show production dropping back from the boom at the first and middle of the year when Suez oil flow was stopped and Europe depended on Venezuela for supplies. Mexico stayed about the same in absolute terms, but lost ground relatively as the remainder of the world generally increased.

The most startling increase was shown by Russia. Production jumped from about 9.5% of the world to 13.2% in 1957. The coming industrialization of Siberia will increase production even faster and this area can be expected to grow at the same rapid rate in the future.

Indonesia showed a slight increase, almost all of it due to Caltex' increased production from the Minas field.

In the Middle East only one country, Iran, had a gain in relative position over last year's. The others increased their production slightly over last year, but either stayed the same or lost ground. Iraq was (and is) particularly hard hit. Her share of the world's output of crude dropped sharply to 2.3% from 3.9% last year. The pipelines are now in the last stages of repair, still Iraq has a difficult time increasing production.

The first drops of oil from the Sahara reached the Mediterranean, too late to make a total large enough to raise Algeria's extremely low level, but a forerunner of what is to come. This area will become one of the world's major producers, political conditions willing. The geology of the area makes it unlikely that discoveries made there at Edjele, Tigentourine, and most of all at Hassi Messaoud, will be small. They are major finds and more are coming up.

WORLD CRUDE PRODUCTION

(Thousands of Barrels Daily)

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1957 Year	1956 Year
United States	7,626.3	7,363.3	6,827.0	6,898.3	7,178.7	7,151.0
Canada	529.3	527.1	502.6	475.0	508.5	462.6
Mexico	255.3	243.6	247.1	252.0	249.5	257.1
Total North America	8,410.9	8,134.0	7,576.7	7,625.3	7,936.7	7,870.7
Argentina	92.6	90.8	91.9	91.9	92.0	85.1
Bolivia	9.7	9.6	9.8	10.2	9.8	8.8
Brazil	24.7	19.7	24.8	32.5	25.4	11.1
Chile	10.8	11.3	11.9	11.2	11.3	9.5
Colombia	120.8	122.1	121.6	122.2	121.7	120.4
Cuba	1.1	1.0	1.0	.9	1.0	1.5
Ecuador	8.4	8.5	9.0	8.8	8.7	9.8
Peru	51.7	53.0	53.0	53.1	52.7	49.9
Trinidad	87.5	94.3	95.6	97.5	93.7	79.0
Venezuela	2,855.4	2,942.7	2,748.6	2,675.3	2,805.5	2,456.8
Total S. America & Caribbean	3,263.2	3,353.0	3,167.2	3,103.6	3,221.8	2,831.7
Total Western Hemisphere	11,674.1	11,487.0	10,743.9	10,728.9	11,158.5	10,702.4
Algeria	.4	.3	.2	.2	.3	.7
Austria	61.2	63.4	58.8	57.0	60.1	63.7
France	28.5	28.4	27.5	27.5	28.0	24.1
Gabon	.9	3.8	3.5	5.0	3.3	0.0
Morocco	1.6	1.6	1.6	1.5	1.6	2.0
Germany (Western)	73.1	76.0	78.4	79.5	76.8	68.5
Italy & Sicily	19.3	26.8	31.8	32.5	27.6	11.5
Netherlands	27.1	28.5	28.8	32.0	29.1	20.6
United Kingdom	1.7	1.7	1.7	1.7	1.7	1.3
Total W. Europe & No. Africa (Excl. USSR)	213.8	230.5	232.3	232.4	228.5	192.4
Albania	6.0	6.0	6.0	6.1	3.6	6.0
Czechoslovakia	3.5	4.0	4.0	4.1	3.9	3.0
Hungary	13.9	14.1	14.0	15.0	14.3	21.9
Poland	3.7	3.7	3.7	3.7	3.7	7.0
Romania	218.4	218.4	219.2	221.0	219.2	230.6
Yugoslavia	7.8	8.4	8.7	8.8	8.4	6.0
USSR	1,903.9	1,903.9	1,998.7	2,093.4	1,975.0	1,565.0
Total USSR & Sat.	2,157.2	2,149.5	2,255.1	2,352.1	2,445.8	1,845.0
Bahrain	30.0	30.1	32.3	34.5	31.7	30.0
Egypt	30.3	45.9	45.5	46.5	42.1	36.6
Iran	672.3	691.6	720.0	775.0	714.7	534.4
Iraq	242.4	422.0	481.4	510.0	413.9	641.8
Israel	1.1	1.4	1.2	1.2	1.2	0.5
Kuwait	927.4	1,153.2	1,289.0	1,234.0	1,150.9	1,075.2
Neutral Zone	38.8	52.5	72.3	77.5	60.2	32.0
Qatar	123.5	126.4	152.2	154.0	139.2	122.4
Saudi Arabia	724.9	1,060.6	1,145.1	1,030.0	990.2	986.2
Turkey	4.9	5.4	6.4	6.4	5.8	5.7
Total Middle East	2,795.6	3,589.1	3,945.4	3,869.9	3,549.9	3,397.6
British Borneo	119.7	120.0	121.1	121.1	120.5	116.1
Burma	6.8	8.9	9.8	10.1	8.9	4.1
China (Communist)	25.0	30.0	34.0	34.0	30.8	19.3
India	9.2	9.1	9.0	9.2	9.1	7.9
Indonesia	275.5	305.2	326.0	355.0	315.4	254.1
Japan	6.6	5.9	5.9	6.3	6.2	6.1
New Guinea	7.0	6.4	6.0	5.9	6.3	7.1
Pakistan	5.8	5.9	6.0	6.0	6.0	5.9
Total Asia & Australasia	455.6	491.4	517.8	547.6	503.2	422.8
TOTAL EASTERN HEMISPHERE	5,622.2	6,460.5	6,950.6	7,002.0	6,737.4	6,049.8
WORLD TOTAL	17,296.3	17,947.5	17,694.5	17,730.9	17,895.9	16,752.0

PERCENTAGE DISTRIBUTION OF WORLD CRUDE PRODUCTION

Principal Countries	1957	1956	1955
United States	40.4	43.2	44.2
Canada	2.9	2.8	2.3
Mexico	1.4	1.5	1.6
Venezuela	15.8	14.7	13.8
Romania	1.2	1.3	1.4
USSR	13.2	9.5	9.2
Iran	4.0	3.3	2.1
Iraq	2.3	3.9	4.5
Kuwait	6.5	6.5	7.1
Saudi Arabia	5.7	6.0	6.3
Borneo	.7	0.7	0.7
Indonesia	1.8	1.5	1.5
Principal Areas			
North America	44.6	47.5	48.0
South America	18.1	17.0	16.2
Europe (Incl. USSR)	14.5	12.5	12.0
Middle East	20.0	20.5	21.3
Asia and Australasia	2.8	2.5	2.5
Western Hemisphere	62.7	64.5	64.2
Eastern Hemisphere	37.3	35.5	35.8

Refrigerated propane tankers to be built in Italy

by A. M. Stahmer

DOMENICO MARCIANO, the Italian "scrap king," is building a shipyard in Livorno, Italy, destined exclusively for the construction of oil and LPGas tankers through the cooperation of the American shipping firm Marine Transport Lines Inc., New York.

The Livorno project was originated by the wish of Marine Transport Lines to build three 40,000 dwt oil tankers in Europe and to examine at the same time the possibilities for gas transportation from the Persian Gulf to Europe. When it was found that the order books of all shipyards in the northern countries were complete up to 1962 and even 1963, Marine Transport Lines contacted Domenico Marciano who, as owner of the largest private Italian scrap yard in La Spezia (where some of the most famous Italian battleships were scrapped), has high-quality steel for the production of ship plates at his disposal.

Marciano decided to build a new tanker yard in Livorno, and for this purpose bought a 200,000- square-meter site on an industrial canal. Work was begun last March, and it is to be expected that the construction of the first tanker can start in March 1958. Due to the fact that the canal bordering the site is comparatively narrow and that the site itself is limited in shape and space, Marciano decided upon a solution which turns a handicap into a benefit. The hulls are going to be built on two level concrete platforms (no slipways) separated by a newly constructed canal and surrounded by a wall 28 ft high. The canal entrance can be closed by a flood gate.

When one tanker is completed, water will be pumped into the closed space flooding the ship so that it can be drawn by winches from the building platform into the canal. As each platform can take three large tankers per year (vessels of more than 40,000 dwt), the capacity of the Livorno yard will be six vessels annually with a total tonnage of about 250,000 to 300,000 tons. The schedule is to mount a daily quantity of 250 tons of steel on both building platforms. Similar to the method already being practiced by other yards, the ship plates are to be welded in prefabrication workshops in pieces up to 80 tons, and will be joined together on the building site. The total building costs for the yard are figured at $9 million, which is less than the presumable price for the first tanker to be built. Delivery of the first vessel is forecast for mid-1959. The second vessel is expected to be completed in September 1959, to be followed by two further tankers in December 1959 and January 1960.

The new Livorno yard is operated by Conditioned Power Co., Rome, which is 70% owned by Domenico Marciano. Chairman and partner is Admiral Angelo Parona.

As mentioned above, the building program comprises two types of vessels: normal oil tankers of 40,000 dwt up to 100,000 dwt, and propane gas tankers. As regards the oil tankers, it is planned to build only the hulls in Livorno and to tow them through Gibraltar and the English Channel to the Howaldtswerke, Hamburg, where the vessels are to be fitted with German turbines, boilers, etc. This project opens an aspect of cooperation between the North European and Italian shipyard industry which is unique in the history of shipbuilding.

For the transportation of LPGas from the Persian Gulf to Europe, a type of vessel has been designed in Livorno which can transport refrigerated propane under normal pressure. For this purpose, the vessel will carry six midship twin tanks with a capacity together of approximately 4,000 tons, which can accommodate about 25,000 tons liquid propane at a temperature of —45 C. The vessel also can carry 10,000 tons of crude oil or finished mineral oil products in wing tanks. The propane tanks will be built of demagnetized nickel steel and be sprayed on the outside with a special insulating material. They are to be separated from the oil wing tanks by a 4-in. space. The six tanks are to be mounted on 36 *I*-shaped iron blocks with wooden caps in order to eliminate electrostatic charge. They also are to balance the tension created by the differences in temperature between the propane and the vessel's outer wall.

The propane meant for export to Europe is to be separated in the Arabian fields from natural gas. Loading the tankers will create a propane temperature rise of only 5 C. During the sea voyage under normal pressure, the liquefied propane will suffer a daily loss through evaporation of about 0.55%, which is to be reliquefied by a special compressor plant on board the ship. On discharge of the vessel, about 2% of the propane will remain in the tanks in order to prevent a rise in temperature in the loading tanks on the ballast trip.

The gas tankers will be equipped with General Electric turbines of 16,000 hp., which will give the vessels a cruising speed of 17 knots. Measurements of the vessels will correspond more or less to those of the 47,000 dwt tankers (length between perpendiculars, 763 ft 3 in.; breadth moulded, 102 ft; draft design, 36 ft). Building cost of the new LPGas tanker developed in Livorno, as against pressure LPGas tankers now in operation, will be about half. Building costs will range between $500 and $600 per ton LPGas loading capacity and $200 per ton oil-tank space.

The gas tankers will be managed by Marine Transport Lines Inc., which owns and operates about 80 vessels, including three special chemical carriers as well as all foreign-flag tankers of Gulf Oil Corp. The tanker-building project in Livorno was initiated by the company's European representative, Gifford S. Rossi, who from 1952 to 1955 was director of the Hamburg office of Stavros S. Niarchos. The general agency in Germany for Conditioned Power Co. and Marine Transport Lines for the Livorno project lies with the shipping owners and agents Messrs. H. Schuldt, Hamburg.

As things stand at this moment, it seems that the first propane cargoes will be shipped from the Persian Gulf to Germany by the end of 1959. Prospective industrial consumers would have to build a cracking plant in order to make use of the propane. At present, LPGas is offered ex-Rotterdam refinery at about 5 cents per liter. The liquid propane to be carried in the new special tankers from Arabia is expected to cost no more than half that sum. END

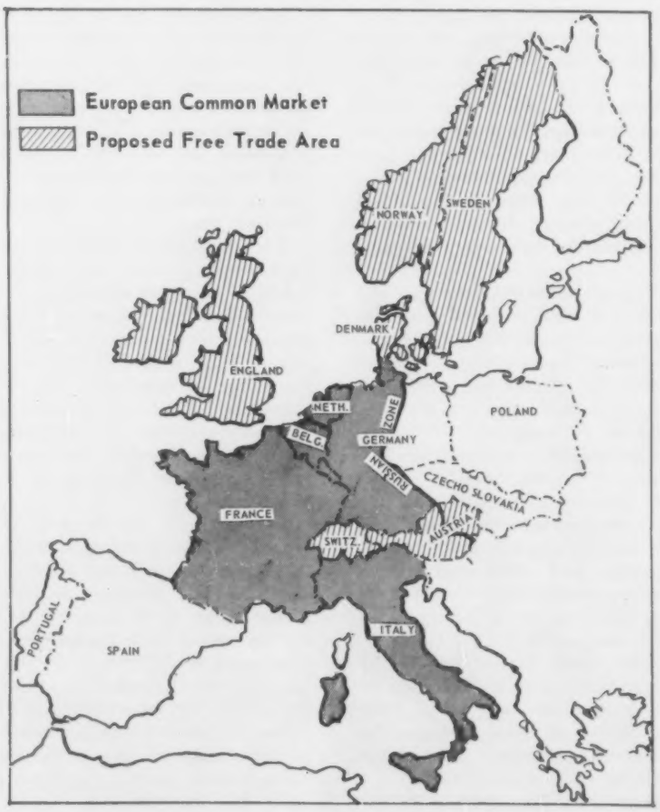
Industry studies

Europe's common market

ON January 1 a revolutionary step in the direction of economic unity was taken by the six European nations making up the European Economic Community, usually referred to as the "common market." Far more ambitious than a customs union, the common market provides eventually for the free movement of goods, capital, and workers within the six countries; and erects a uniform tariff wall around the community. An investment bank is to be set up which will promote expansion and modernization of industrial plants in the community. Economically, the six nations plan to become a single self-contained, efficient economic unit.

Oil-industry leaders are studying the new community intently in an effort to determine what effect it may have on the international oil trade in western Europe. Aside from the stimulation in consumption which may be expected as a result of the common market, the industry does not anticipate radical early changes.

In the field of general manufacturing, the community is expected to bring about some movement of enterprises, some mergers, and the erection of factories of greater size and efficiency. With larger plants, it is thought that assembly-line techniques can be adopted and automation used to increase the output per worker.



Increased worker output is expected to permit the payment of higher real wages and thus increase the standard of living in western Europe. Any such increase will, of course, greatly benefit the petroleum industry, since greater use of horsepower goes hand in hand with rising productivity and rising living standards. With coal and hydroelectric resources limited in the 6-nation area and mass use of nuclear energy still distant, petroleum will benefit from any growth in energy requirements.

In the next round of oil-refinery construction, the dropping of internal tariff barriers may have a substantial effect on the size, location, and design of oil installations. Thus far most plants, particularly in France, have been located on the southern and western seaboards. Under the community idea, interior refineries might be located with primary regard to product demand and transportation—completely ignoring national boundaries.

There are some who feel that, under the EEC plan, the proposed new Strassburg refinery may not be built because the eastern French market might be served more economically—at least in the immediate future—from other existing and projected plants.

Elimination of tariff barriers within the group may tend to stimulate the construction of products lines for low-cost delivery of finished products from large refineries. This has been the history in the United States where low manufacturing and transportation costs are essential in a highly competitive market.

In the case of specialized plants, it may become convenient to centralize lubricating-oil manufacturing in a few large, economical units rather than a large number of small, high-cost plants. Similarly, petrochemical specialization may create economies where no tariff barriers are present between members of the community.

The six nations now are not exporters of usual petroleum products, so no immediate

Inauguration of the European common market on January 1 by six western nations is causing oil-industry leaders to study the move to integrate the various economies over the next 15 years. Little immediate change in oil-industry facilities is visualized.

change of major proportions need be anticipated. The petrochemical industry, however, is still in the early stages of its growth, and the trend of its development may be affected at an earlier stage in the history of the community.

The community nations, outside of Germany, do not now impose a tariff on crude oil. Germany does so to protect its domestic producers and to stimulate the search for indigenous supplies. France subsidizes the search for oil in a different manner.

Members of the community have obligated themselves to abolish all crude and shale oil import duties within a 15-year period. Government assistance to domestic producers is not forbidden, however, if domestic oil cannot be produced at world prices. In any case, the treaty provisions with respect to gradual implementation and the granting of exceptions make it clear that Germany can retain its existing duties for at least six years. Most duties are to be reduced stepwise over a period of 12 to 15 years.

Various members of the EEC now protect domestic refining operations in one way or another against products of foreign refineries. Protection is greatest for white products, and usually very low on heavy fuel oil and diesel fuel. It is anticipated that refinery protection throughout the area eventually will become uniform.

Taxes on refined products within the community now vary widely. In Benelux, the rate on motor fuels is about half that imposed in Italy and France. The common market does not require uniformity in domestic tax rates—only in international movement within the borders of the group.

At some time in the future it is planned to establish uniform import duties on goods from outside the 6-nation bloc. Rates on carbon black and asphalt have been fixed.

Others will be set up in stages over 12 to 15 years, or in one step after six years.

It should not be supposed that development of the common market will be without its difficulties. There are, of course, nationalistic pride and aspirations to interfere. In some cases, one member of the community may fear that another will gain in employment, investment, or trade. The French monetary troubles present some difficulties. There are numerous escape clauses which can delay full realization of the scheme.

The General Agreement on Trades and Tariffs in Europe requires any country reducing duties in favor of another GATT member to extend the reduction to all other members. Several of these are outside the free-trade area. Negotiations were in progress as this was written to find "the most effective method of implementing the interrelated obligations which governments have assumed in the two instruments."

Discussing these negotiations, the Geneva correspondent of *The Financial Times* of London recently wrote that "because of the determination of the six common-market countries to show that the scheme should be considered as here to stay, the present committee cannot be considered purely as examiners who would return at a fixed date with a passed or failed verdict.

"It is rather the first step of a permanent machinery of consultation and negotiation which will accompany the establishment of the common market all through the 15 years of its transitional period.

"The early establishment of such machinery is casting much light on the urgency of the free-trade area negotiations which began in Paris on November 14."

As against the various difficulties confronting the EEC, observers point out that the six countries have had a taste of the results of integration and cooperation. The results have been highly satisfactory, so that now the members have a real determination to proceed—which is shown by the speed with which preliminary negotiations were conducted and the Treaty of Rome ratified.

Roots of the common market go back to the Marshall plan at the close of World War II, which gave Europe a chance to get on its feet again.

A byproduct of the Marshall plan was the Organization for European Economic Cooperation (OEEC), the European Payments Union (EPU), the North Atlantic Treaty Organization (NATO), and the European Coal and Steel Community (ECSC). Each of these has broadened the field of cooperation within the six nations.

One result of the postwar cooperative method of approach has been that the European economy has been growing at a much faster rate than has the American economy since 1951. The ECSC has been particularly successful. Exchange of ECSC goods rose 92% between 1952 and 1955, while non-ECSC goods trade rose 64%. Trade in scrap rose 262%, and in iron and steel products 114%. This is significant because ECSC goods are heavy and difficult to transport.

In the entire western European area, gross national product rose 27% and industrial production 38% between 1951 and 1955. It has been estimated that gross national product in the common market will rise another 17% by 1960. Oil consumption is expected to go up 53%.

Six other nations not within the EEC now are considering the establishment of a free-trade area among themselves and with the EEC. Included in this group are the United Kingdom, Switzerland, Austria, Denmark, Norway, and Sweden. These countries would retain the right to set up their own tariff barriers against imports from non-free-trade countries. England would be able to join such a plan without destroying its present trade relationships giving preferences to members of the British Commonwealth nations. Should the six nations proposing a free-trade bloc be successful, it is likely that others would join—including Spain and Portugal, Greece, Turkey, and Finland.

People in the entire western European area are eager to improve their standard of living. They are interested in obtaining labor-saving gadgets in the home and in automobiles. Great strides have been made in this direction since the war, and the common-market idea is expected to accelerate the trend. END

Above: An ancient olive tree is spared.

Left: Unloading pipe on right-of-way.

Right: Moving pipe from truck to trench.

Left: Aligning pipe for welding.

Right: Lowering pipe with "man-powered" side boom.

Below: Pipeline right-of-way adapted to olive grove.

Ragusa field success stimulates oil search in Sicily

Ragusa production at the turn of the year reached 35,000 b/d, and a steady development drilling program is in progress. Heavy oil discoveries in nearby areas give promise of additional commercial production in Sicily.

RAGUSA No. 1, the first commercial oil well to be drilled in Sicily, has produced more than a million barrels in less than four years. Completed in January 1954 by Gulf Italia on its 74,000-hectare concession in the southeastern section of the island, the Ragusa discovery has touched off a leasing and exploration campaign which has extended into every part of Sicily. The present output of about 35,000 b/d is a powerful incentive to exploration in Italian territory because of the nation's lack of domestic oil resources.

Since Gulf's success, one additional field has been found by others, and two other wells have showings which suggest that commercial production may be obtained as a result of further stepout drilling. All three are in the general vicinity of Ragusa, and all showings are in the same horizon—a dolomite in the upper Triassic.

While the wildcat program has been prosecuted, Gulf has been drilling at a steady pace to develop the Ragusa field and determine its producing limits. In late September, 27 wells had been completed—of which 24 were being operated. One was dry; and two others are edge wells not being produced because of the thinness of the producing section above the water table. Three development rigs are being operated in the field in addition to a light rig for stratigraphic testing.

The 1958 program envisages the completion of some 15 or more development wells. The one dry hole is east of the producing limits of the field, and revealed the existence of a fault as a barrier in that direction. The stratigraphic rig now is feeling its way in an effort to determine the exact location and direction of the fault. The two edge wells are on the southwest and northwest flanks, but Gulf has found no indication of a limit to the west.

Development thus far shows that Ragusa is a dome with a small gas cap. Major source of reservoir energy, however, is the active water drive. At the center of the field the producing section has a thickness of about 1,500 ft including the gas cap, or about 1,200 ft of oil-saturated relief. The oil is a 19.5 to 19.7 API gravity sweet crude. It is a high-viscosity oil at low temperature, testing 6,700 Saybolt seconds at 60 F. Some heating of the oil may become necessary this winter if the pipeline capacity from field to seaboard is to be maintained at a desired level.

While the Ragusa wells will flow—particularly those below the crest of the high hill which marks the field's surface—all are being pumped as a matter of convenience and to obtain maximum yields without undue change in the water level. Three observation wells were drilled into the water, and are used for production control.

In eight of the wells, submerged Reda pumps are being employed. These lift an average of about 2,000 bbl per well per day. The remaining 16 wells being pumped are on the rod. Two Parkersburg units have 4-in. plungers operating with an 108-in. stroke, while others employ an 84-in. stroke. Operating in this way, the big Parkersburg units lift an average of 2,000 b/d. Some smaller Walfel units are operating with plungers ranging from 2½ in. to 3¼ in. Because of the high fluid level, it has been found that the pumps are operating at 90% efficiency.

In every case the pumps are lifting the oil from the well and to the field storage tanks from which the pipeline pumps take suction. Thus far, the pumps have been unable to draw down materially the fluid level in producing wells even when lifting up to 2,000 b/d.

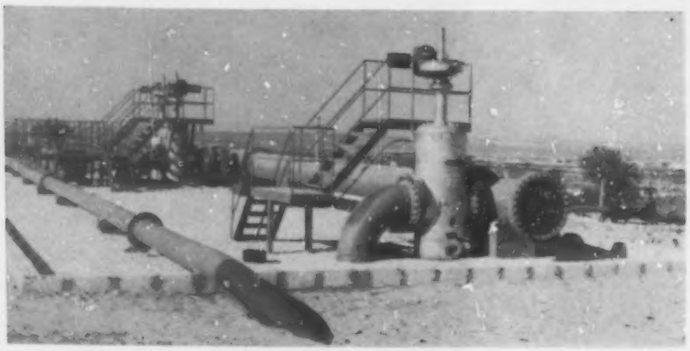
Ragusa field wells are drilled to approximately 6,000 ft, and are acidized to complete them. Drilling is not difficult, although some of the formations are relatively hard. Average bit consumption is about 40 per well, which is less than half the number required in some wildcats in other parts of Sicily. One of the three development rigs is light, but it has been giving good results to 6,000 ft. Other rigs are medium-duty.

Ragusa pumps are operated by electric motors supplied by purchased power at present. Gulf has ordered four Ruston-Hornsby gas turbines and four 900 kw Peebles generators to replace the purchased power. At the outset, at least the gas turbines will burn oil. Later it may be possible to use formation gas if an economical method can be found to process it. The gas produced with the oil has a CO_2 content of more than 60%, which makes it unsuitable for fuel without purification. In this respect the gas is similar to that found by AGIP, the Italian government company, in the Miso field near Catania on the east coast.

Early in the life of Ragusa, the oil was shipped by tank car and tank truck, largely to the Rasiom refinery at Augusta. Within the past year a 41-mile 14-in. pipeline has been laid to the Augusta tank farm plus, a 4.2-mile extension of 30-in. line to the Magnisi peninsula where a modern loading dock now is being built. The 30-in. line will deliver 15,000 to 20,000 bbl per hour by gravity from the two 150,000-bbl pipeline-terminal tanks. The concrete loading dock extends out 300 ft from the shore, where there is a water depth of 46 ft. Tide at this point is only about 1 ft. One 300-ft berth is being built at this time.

In building the dock, concrete caissons are cast at a nearby town and towed to the pier site where they are sunk and dug down through silt to rock. They then are pumped full of concrete, except for demolition holes required by the military.

The pipeline from Ragusa to the coast has been delivering an average of 30,000 b/d with only one pump station from field storage. Three 250 Ideal pumps driven by 300-hp Marelli motors lift the oil to a high point in the line from which it moves by gravity. Two more pumping units will be installed later and, as mentioned previously, it may be necessary to add some heat to the oil in winter. Gulf Italia was faced with a delicate problem in laying its pipeline. The route runs through an area thickly planted with olive orchards. Many of these trees are centuries old, and could not be replaced for many years if destroyed. The Sicilian farmers were not especially interested in money as reparation which might be spent quickly, but in the preservation of their capital, the trees. An Italian contractor was retained who understood the people and—



Motor-operated WKM valves at pipeline terminus.

by employing hand labor almost exclusively and through careful engineering—few, if any, trees were lost. Fears that disturbance of the soil by trenching would destroy fertility were proved groundless also. The turned-up earth proved to be as rich or richer than the topsoil.

In its Sicilian operation, Gulf has followed a policy of training and employing local people. After four years, the company now has only a few foreigners on its staff compared with 719 Sicilians. Employment is 95% Sicilian.

Thus far, Gulf has spent 30.3 billion lire ($50 million) in its Sicilian adventure for capital investment, labor, and supplies. It has purchased 4.2 billion lire in supplies and equipment made in Italy and exported to other countries. At Ragusa, the company is building a new and modern office building to replace the temporary quarters occupied during the development period. Outside of Ragusa, Gulf has not been so fortunate in its drilling campaign. On the Ragusa concession alone, five dry holes have been completed. A sixth wildcat now is being drilled. On its eight other concessions in Sicily, Gulf has drilled five tests thus far without result. Additional drilling on these is planned to examine other structures.

Outside the Ragusa concession, Gulf has interests in some nine exploration permits. Five of these permits are owned as to 50% by Gulf—the balance being held by the well-known Italian chemical firm of Montecatini. The other four permits are held as to 65% by Gulf, and the balance is held by the Macmillan Petroleum Corp., of Los Angeles. Exploration is actively proceeding in these permit areas.

Geological and geophysical reconnaissance work in Sicily is very difficult because of the complicated formations on the island. Stratigraphic tests are erratic for that reason; and, even in a field such as Ragusa, the logs of offset wells are not comparable. There are numerous surface indications of petroleum, however. The Ragusa field underlies a deposit of rock asphalt which has been mined for perhaps a thousand years. There are seeps of light oil in caves in other parts of the island—the oil being of diesel-fuel quality as collected. Gulf began its reconnaissance work in Sicily in 1948 with a rough survey of about 300,000 hectares, including the use of the flying magnetometer and aerial photography. Interest centered on an area of 100,000 hectares around Ragusa which was made the scene of detailed seismic and geological studies, and led to the location of Ragusa No. 1 on which operations were begun, May 21, 1953.

Sicily has been prospected for oil and gas at various times since 1901. As early as 1930, USA geologist J. Elmer Thomas sought to interest the industry and the government of Sicily. At that time the government did not welcome foreign capital, and it has only been since the close of World War II that the legal climate has made operations attractive. In 1935 Sicily became autonomous, but it was not until 1950 that the present Sicilian oil law was passed. Sicily now has its own regulations, which differ materially from those on the Italian peninsula where leasing is completely restricted to the government oil enterprise ENI in the area considered most favorable for oil and gas and where, in other areas, private enterprise is discouraged by the level of royalties plus taxes demanded. Gulf, for example, teamed with Montecatini on the peninsula, and found encouraging shows, but withdrew after the new Italian oil law has been adopted. Applications for exploration permits in Sicily at the moment are for some 15 wildcats now being drilled. Last year Sicilian production rose 225%, to 10,000 b/d, while total production in other parts of Italy dropped sharply. This year Gulf will average about 30,000 b/d from Ragusa—another 200% increase. In addition, some oil from Gela will have been added to the Sicilian output. In 1958 Ragusa may produce 40,000 b/d or more, and other Sicilian prospects may come into commercial operation.

At Gela on the south coast, AGIP has a heavy oil field of 6-gravity high-sulfur oil which is not attractive to most refiners. In order to lift the oil from wells, it is necessary to pump a light gas oil down the bore hole. About 9% by volume is injected. Once the oil is aboveground, an additional 15% must be added so that it will flow through the pipeline to the coast. Net production of Gela No. 1 is about 1,200 b/d from the dolomite. AGIP now is drilling three additional wells at Gela, and is ordering two new rigs to step up development. Plans are afoot to build an asphalt plant at or near

(*Continued on page 58*)

Field storage tanks at Ragusa are enclosed in masonry fire walls. Earth is scarce on the rocky Sicilian upland.

Parkersburg pumping unit which lifts 2,000 bbl of Ragusa crude daily.

Lee C. Moore medium-duty mast drilling at high point in Ragusa field.

Canadian gas development threatened

On November 8, 1957, a simple statement by the Canadian prime minister, John Diefenbaker, in the House of Commons, consisting of not as much as 100 words, set back the whole future of the natural-gas producing and pipelining industry by at least two and possibly three or more years. The statement, in reply to a provocative question by an opposition leader (Hon. Solon Low of Alberta, leader of the Social Credit (minority) Party in parliament), was to the effect that no further permits for natural-gas export will be considered until the royal commission on energy sources and requirements has made its studies, conducted all its public hearings across the country, and reported on its findings.

The record of royal commissions—especially the rare ones with such wide terms of reference as this body under the chairmanship of Sir Henry Borden of Toronto—has been that their hearings seldom involve less than a year, their reports another year, and legislative action on their findings anywhere from a year to infinity. Several royal-commission reports have been buried and completely ignored by governments because the findings did not conform to the policy of those governments.

Politically, the prime minister's statement could not be challenged on any reasonable grounds. The conservative government was put into office in the general election of last June 10—although without a working majority—on a widespread platform of nationalistic policies, which included the confirmation of a restrictive attitude towards the movement of hydrocarbons and other forms of energy across the international boundary. One of the major planks in its platform was the insistence that Trans-Canada Pipe Lines Ltd. must complete its natural-gas pipeline across Canada to Toronto and Montreal before any consideration would be given to its pending application for permission to export gas to the United States at Emerson, Manitoba.

Under dominion legislation, the Board of Transport Commissioners has absolute jurisdiction over the route of any proposed pipeline which crosses a provincial boundary—even to another Canadian province. In effect, this means that the board can control the destination of any movement of either natural gas or oil. So far there has never been any official objection to export of crude oil—which moves as freely into the United States as American policy, now represented largely by the Carson committee on voluntary limitation of oil imports—will permit. There has always been strong objection to export of natural gas, which for some reason is linked in the Canadian public mind with national sentiment which has never been applied to oil.

The application of Trans-Canada Pipe Lines Ltd. for permission to build a pipeline from Winnipeg to Emerson, for the purpose of exporting upwards of 200 mmcf of natural gas per day to Midwestern Gas Transmission Co., in Minnesota, has been before the transport board for more than two years. Prior to the prime minister's statement of November 8, there had been some intimation that the board might be disposed to grant a permit if the Federal Power Commission in Washington would grant an import permit to the American recipients of the gas. This intimation had been made through a letter from Rt. Hon. C. D. Howe to the company, when Mr. Howe was minister of trade and commerce in the former liberal government.

Such a letter would not, under the Canadian parliamentary system, be binding on the government, as it expressed the opinion of only one minister in the large cabinet and would have to be validated by cabinet action. Whether this would have happened if the liberals had stayed in office is purely academic, as it would have involved a concession beyond anything which had ever been stated by either the liberal prime minister or his cabinet. In any case, once the government changed, even official expressions of policy would be abrogated unless they had been translated into legislative action. Decisions of the transport board do not constitute legislation.

The prime minister's declaration was thus the only possible answer to a question whether the pledge of a former cabinet minister under another administration would be honored by the present government. The economic implications, however, can be catastrophic for the future development of the natural-gas industry, which had been on the point of awakening from the long period of deep freeze into which it had been sunk by many years of indecision. The extraordinary and fortuitous licensing of the Westcoast Transmission Co. Ltd., pipeline to the west coast, which slipped through in a period of temporary relaxation a few years ago, caused a flurry of drilling activity in the Peace River gas-discovery and development region. This outburst was short-lived, and it has subsided almost completely in the face of the indefinite delay which appears certain as a result of the declaration in parliament.

The impact of the official expression of policy on the petroleum industry is just beginning to become apparent with the outburst of a flood of criticism by the major oil companies and one prospective gas pipeline company. A two-fisted hard-hitting campaign of public persuasion is the first line of attack. For this purpose, three top executives addressed service clubs across Canada in one single week in mid-November—demonstrating their companies' opinions about availability of natural gas, prospective future growth of reserves in Canada, the economic necessity of export of gas to stimulate further exploration and development, and the damaging effect of the past and present policy on the finances of producing companies which have capital invested in capped gas wells.

W. M. V. Ash, president of Shell Oil Co. of Canada Ltd., led the attack with a speech to the Canadian Club of Toronto. He pointed out the 24 trillion (24 mmmcf) cubic feet of natural gas already proven in Alberta, and asserted that the geological and geographic factors in western Canada virtually insure the discovery of five to ten times this amount in the next 10 to 15 years. The growth of the domestic market, he said, cannot possibly absorb more than a small proportion of the indicated reserves or even all the presently proven reserves, and he emphasized the export market as providing an outlet which would help to correct the serious unfavorable balance of trade which Canada is now suffering.

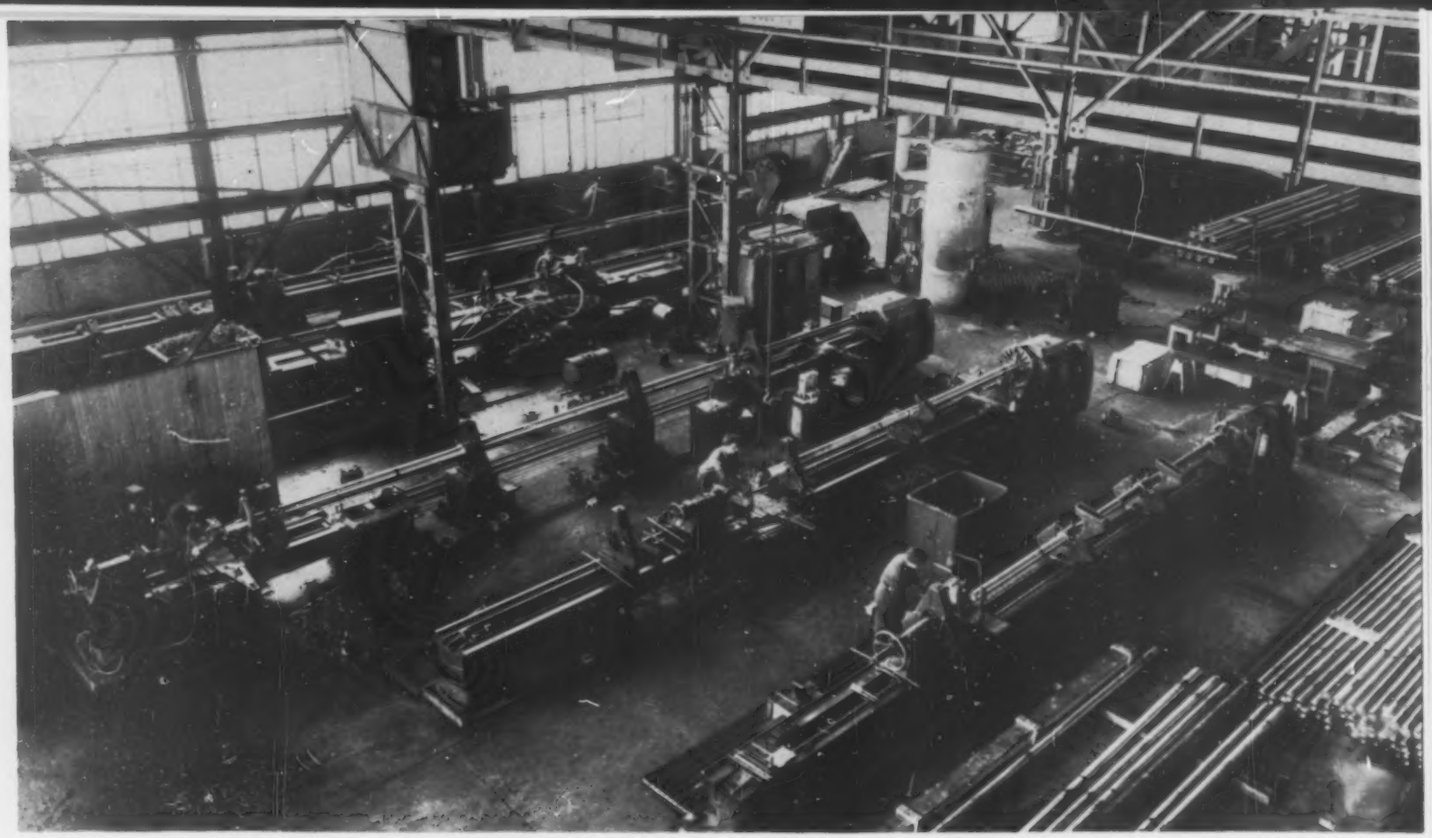
J. K. Horton, president of Alberta and Southern Gas Co. Ltd., told a service club in Calgary that the owners of natural-gas reserves have $150 million tied up in idle capital in the form of capped gas wells from which there is no visible market for the gas in the near or medium-term future. He deplored the depression of incentive to develop more gas while this condition exists, and urged export as the only solution to a distressing unemployment of capital.

E. D. Loughney, senior vice president, The British American Oil Co. Ltd., assured another service-club audience in Toronto that the present trend of gas discovery, even with minimum incentive, appears to offer development of 74 trillion cubic feet (74 mmmcf) of reserves in the next 25 years. This would take care of domestic requirements in that period, provide for all export lines now in operation or planned for future construction, and still leave enough for 40 years' Canadian needs at the estimated 1980 scale of consumption.

Unless adequate export markets are forthcoming without delay, Mr. Loughney concluded, it will be necessary for many companies to cut back their operations—and without export markets Canada's natural-gas industry will never mature.

Prospective users of gas in the deficiency areas of the United States are equally concerned. The region of greatest deficiency is ODM District V, particularly the Pacific Northwest states and California, which are now receiving gas from the Westcoast line. Pacific Gas & Electric Co. has a firm agreement to take 400 mmcf per day from the proposed Alberta and Southern pipeline, in which it is committed for a financial and management interest if an export permit can be secured. Southern California Gas

(Continued on page 72)



Drill-collar production at the Ternitz plant, Lower Austria, of Schoeller-Bleckmann Stahlwerke AG.

Austrian oil decision

The Austrian oil industry has been frozen into a rigid pattern of State control. Production is declining—making the reparations burden owed the USSR more onerous. The sensitive political situation has thus far prevented change and development of Austria's good potential, but debates now in progress may denationalize the industry.

by Dr. G. G. Rosu

AUSTRIA'S oil administration in large measure has been formed by political traditions and upheavals beyond her control.

At present, the oil industry is nationalized—managed by government appointees. This is not exactly from choice; nationalization of Austria's mineral wealth is constitutionally inherited. But nationalization of refineries, transportation facilities, terminals, field outlets, etc., has resulted from political machinations. In 1945 Russia sought to pressure Austria into the formation of a joint 50-50 oil company patterned after the Sovropetrol—in which Russia's contribution was to have been the German assets acquired by the Soviets under the notorious Potsdam declaration. However, Austria managed to deprive Russia of this so-called contribution; by law of July 26, 1946, she nationalized a long list of industries—among them the oil enterprises. Motivation of this law was not socialistic, but a desperate attempt to regain control of the German assets seized by Russia in 1945.

Although the nationalization law provides for adequate compensation to foreign interests, decision long has been deferred. Parliament is now discussing the issue.

Management of the oil industry by government officials is not from choice. First, Austria inherited a complex organization, developed by two foreign companies. Second, structural changes are barred by a provision of the Austrian-USSR Memorandum of May 15, 1955, which reads: "After the handing over to Austria of the German assets in the Soviet-occupied zone, the federal government will undertake measures to preclude the transfer of these assets to ownership of foreign powers—including legal persons in a private or public capacity" (Art. I, Par. F). After ratification by Parliament, this provision became the law of the land—forbidding retrocession to, participation by, or granting of concessions to Western oil companies. It is this area, i.e., the so-called German assets, which today constitutes the core of the Austrian oil industry.

The properties of the Western companies

also were nationalized in 1946. They are: Rohoelgewinnungs AG (RAG), owned jointly by Socony Mobil Oil Co. and Royal Dutch-Shell; Van Sickle (Canadian-owned); and Erdoelproduktions GmbH (EPG). They have been conducting their activities under the old administration which, legally, is regarded as government-appointed. Possibly indicative of Austrian thinking is the fact that last July RAG was denationalized and its assets restored.

The Austrian USSR Memorandum provides that the oil industry of Eastern Austria shall remain permanently the property of the Austrian government or its nationals. As insufficient Austrian capital is available for a private company, the government has no choice but to take over and manage the properties.

The nationalized oil industry is under the Oesterreichisohe Mineraloelverwaltung (Mineral Oil Administration; abbreviated, OeMV), assisted by the State Geological Inst. OeMV is subordinate to three government departments which direct its activities: Tutelar authority for OeMV's management activities is vested in the Ministry of Communications and Nationalized Industries; the Finance Ministry guides OeMV activities in the field of investment, pricing, and taxation; and mining operations (including granting of concessions) are within the sphere of the Trade Ministry. Until a year ago, each of these departments appointed a delegate to the OeMV board. Since last fall, however, the four board members have been appointed primarily as representatives of the two political parties which form the coalition government.

OeMV's major task is to fulfill the government's financial obligation toward Russia under the provision of the Austrian-USSR Memorandum of 1955. Roughly 70 million barrels of crude must be delivered to the USSR, in 10 yearly installments, as compensation for the so-called German oil assets which had been transferred to Austria. The 1957 installment amounts to a third of OeMV's crude production—delivered to Russia at no cost.

Prices of some oil products have been cut by the government to buttress domestic consumption—particularly by industry. The price differential is covered by OeMV out of its income. Furthermore, by law of July 1956, OeMV must contribute a substantial share of its net income to a fund for subsidizing milk prices. Losses incurred by OeMV in 1957 because of Soviet reparations, direct milk subsidies, and oil price differentials will total approximately 850 million shillings ($34 million). At the official crude price to refineries, this represents some 12 million barrels, or exactly half of Austria's current annual crude production.

Austria's unusual handling of her oil industry may help explain future trends. Bad management might be inferred from inflicting such severe losses, which exhaust the industry's reserves and prevent expansion. However, if the right to price commodities according to its best judgment be conceded any sovereign nation, then this right can least be denied Austria which for almost two decades was under foreign

Type FR-6 (8) drilling rig of Mannesmann-Trauzl AG, Vienna, Austria.

Puchkirchen No. 1 (RAG), a recent oil discovery in Upper Austria.

occupation and which for another decade must pay heavy reparations to Russia. She is making every effort to make up for lost time. She regards her recovered oil resources as a bonanza, and uses them to meet her most pressing needs.

More important is the question of how long this bonanza will last. An analysis of the economics of the Austrian oil industry may lead to some conclusions.

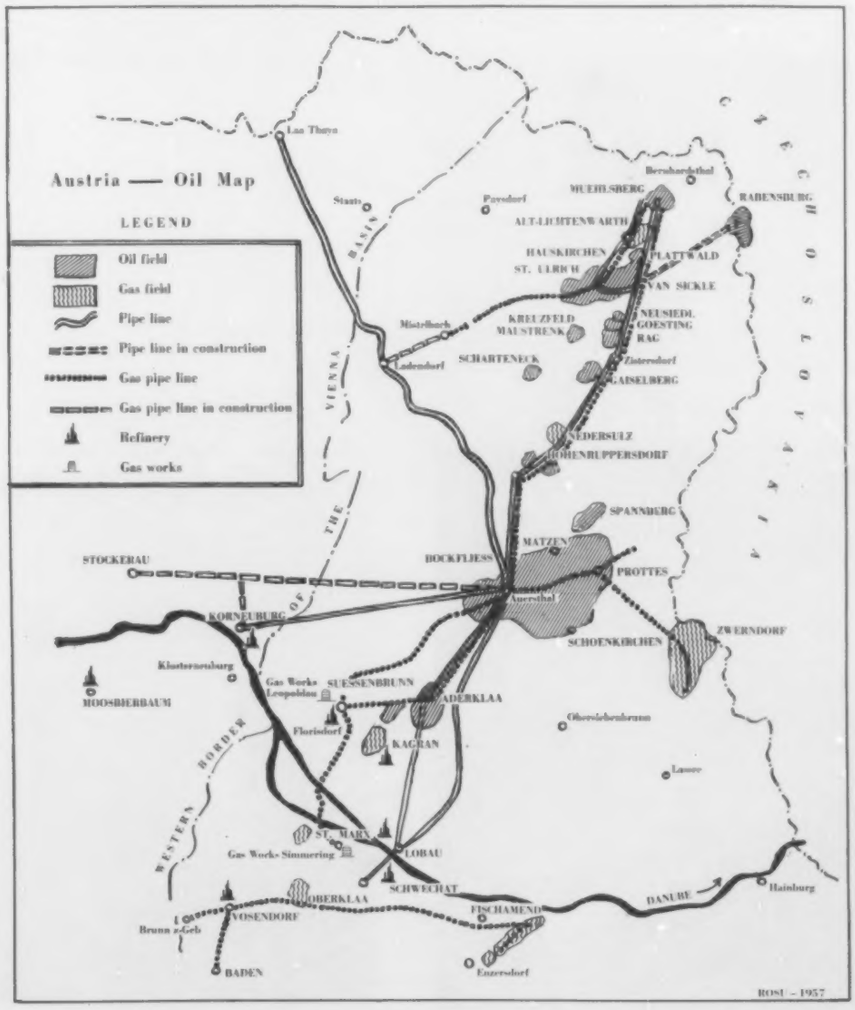
Table I indicates Austria's outstanding producer is Matzen, which accounts for 70% of total output. Discovered in 1949, Matzen soon proved to be Central Europe's richest oil strike. Covering only 1,800 acres, it contains 92% of Austria's proved reserves. By the end of 1955, output per active well had risen to 166 b/d. Though at a somewhat lower rate today, it is still seven times the world average. Producing formation is the Matzen sand—with 16 horizons, of which the richest are the 8th and 16th. Porosity is 28%. Thickness varies between 50 ft and 200 ft. Well depth averages 5,248 ft to 5,576 ft. Moreover, beneath the Matzen sand lies the Helvetian which also has 16 oil-bearing horizons, development of which began last year. Approximately 60% of Matzen's 458 producing wells are flowing. This is the only Austrian region where flowing wells are drilled. Economic exploitation would admit of some 200 new wells to be drilled on this structure, but deepening to the Helvetian certainly will provide for more wells. Matzen's geological conditions account for virtually all the advantages of the Austrian oil industry. These may be outlined as follows:

First are the low exploration costs: 87% of all wells drilled in the entire country between 1937 and 1956 struck oil. In the OeMV development area, this rate reaches 92% (compared with 63% world average). For every foot of wildcat drilled from 1938 to the present, Austria tapped reserves of 8,637 bbl. Comparatively low drilling and lifting costs result from production concentrated on a small area ($1.00 per barrel of crude produced).

Unfortunately, Austria stacked her future on a single field, Matzen. Geologically, the field is unique, and even the most optimistic do not forecast another Matzen. Production trend is downward—the field having declined 5% to 6% in the past two years. To compensate for the decline, OeMV plans to introduce secondary recovery (water flooding).

Second are Austria's reserves. Sedimentary areas cover some 9,200 square miles, or almost a quarter of the country. However, proved reserves (optimistically estimated at 420 million barrels) are low in view of potential area. Of these reserves, 390 million barrels lie in the Matzen area, whose extent is only 28 square miles—which accounts for the odds involved. Therefore, to acquire additional reserves for emergency needs will require intensive exploration over larger and more distant areas.

The Vienna basin offers several promising formations, which to date have been prospected only superficially. There is also large Lower Austria, with a potential of 4,100 square miles—of which only 23 square



Gaiselberg field in Lower Austria, under concession to RAG (Rohoelgewinnungs AG).

A pumping unit of the firm Schoeller-Bleckmann Stahlwerke AG, Vienna.

TABLE I
AUSTRIAN CRUDE OIL PRODUCTION
(In thousands of Bbls)

Concession	Year of Discovery	Wells in 1955	Production in 1955	Cumulative through 1955
Matzen-Bockfliess-Prottes-Schoenkirchen	OeMV[1]	1949/50	332	20,112	79,914
Muehlberg	OeMV	1942	94	2,300	23,076
Aderklaa	OeMV	1949/50	34	1,228	9,448
St. Ulrich-Hauskirchen	OeMV	1938	153	673	26,198
Maustrenk	OeMV	1940	15	39	1,500
Suessenbruenn	OeMV	1951	—	8	139
Rabensburg	OeMV	1954	—	8	8
Hohenruppersdorf	OeMV	1941	1	5	116
Alt Lichtenwarth	OeMV	1949	9	4	33
Neusiedl	OeMV	1936	—	—	176
Scharfeneck	OeMV	1944	—	—	25
Windisch-Baumgarten	OeMV	1930	—	—	4
Gaiselberg	RAG[2]	1938	53	621	17,031
RAG	RAG	1937	17	115	5,158
Van Sickle	VS[3]	1939/40	33	210	7,518
Plattwald	VS	1940	8	33	384
Goesting	EPG[4]	1931	41	291	11,267
Kreuzfeld-Pionier	EPG	1940/41	3	9	116
TOTAL			793	25,656	182,111

(1) OeMV: Austrian Mineral Oil Administration
(2) RAG: Rohoelgewinnungs AG.
(3) VS: R. K. van Sickle.
(4) EPG: Erdoelproduktions GMBH.

TABLE II
AUSTRIA'S OIL RESERVES
on January 1, 1956
(Million Barrels)

Field	Concession	Proven	Probable	Ultimate
Matzen	OeMV	295.4	82.6	457.1
Aderklaa	OeMV	4.2	—	14.0
Rabensburg	OeMV	—	0.7	0.7
Muehlberg	OeMV	13.3	—	36.4
St. Ulrich etc.	OeMV	2.8	—	28.7
TOTAL	OeMV	315.7	83.3	536.9
Goesting	EPG	1.4	—	12.6
Plattwald	VS	0.7	—	8.4
Gaiselberg	RAG	7.0	1.4	30.8
TOTAL GENERAL:		324.8	84.7	588.7

miles have been profitably developed to date.

OeMV's heavy financial burdens drastically have limited its ability to finance an adequate exploration program. In 1956, for instance, its allocations for exploration were $1.5 million at the free-exchange rate; and, though its 1957 allocations are much higher, the entire Austrian oil industry last year disposed of 25 usable drilling outfits (five belonging to private companies.) Even these were old and in need of repair. In view of the scarcity of venture capital in Austria, it must be concluded that any further activity will require financial assistance from abroad.

Despite restrictions imposed by the Austrian-USSR Memorandum, operation conditions for foreign companies are favorable. Though they are barred from concessions in the attractive OeMV area, they can operate satisfactorily on contract. In 1956, private interests applied for concession licenses covering a total 7,700 square miles throughout Austria's geological regions.

Exploration concessions are still governed by the sound provisions of the Bitumen Law of 1938 (following the lines of the German Bitumen Law of 1934). Royalty payment to the Austrian government by foreign operators on the old concessions amounts to a mere 6%. The newer contract signed with NIOGAS (State-owned gas development company) provides for a 30% royalty, whereas the actual rate paid by OeMV (in direct deliveries and price subsidies) may be as high as 55% of income. Both these entities are government-owned and, unlike private companies, pay only nominal income taxes. Therefore, part of the high royalties compensate for lower fees and taxes.

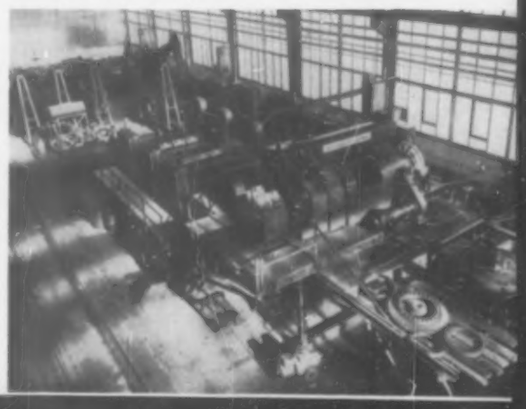
Unification of royalty and tax policies is imperative for the Austrian government, for various pressing reasons—particularly the internal domestic situation. Austrians resent what they regard as more favorable treatment to foreigners than to State-owned entities.

The politically controlled press is outspoken in its disquietude over the oil industry. Remembering the many years of exploitation of their oil reserves by foreign occupiers, Austrians are extremely sensitive to the least reminder of the former "foreign concessions." For that reason, the Western oil companies acted wisely when they refrained from pressing compensation claims for their nationalized properties.

Compensation claims soon will be taken up by Parliament. The Socialist press fears satisfaction of foreign compensation claims will result in denationalization of the oil industry and foreign infiltration. Though the conservatives are not for straight denationalization, the conservative and unaffiliated press does emphasize the present unsatisfactory administrative formula which substitutes "proportional appointment" of members of the coalition parties for efficient and able operators. END

Investiture ceremony for His Excellency Chancellor Raab of Austria on his becoming a Knight of the Deutsche Ritterorden (German Knightly Order).

Heavy-duty rotary unit of Schoeller-Blaeckmann Stahlwerke AG, Vienna.



Review of recent USA cracking patents

by Heinz Heinemann and Harold Shalit

FEED Stock Preparation: A method for preparing a charge oil for catalytic cracking is described by T. W. Pratt (2,770,-576 to The M. W. Kellogg Co.). An atmospheric reduced crude is introduced into a vacuum flash tower. The tower bottoms contain at least 25% of the oil suitable for catalytic cracking. The bottoms are countercurrently contacted with a stream of normally gaseous hydrocarbon solvent at a temperature within 100° F below the critical temperature of the solvent. The extract phase contains cracking charge stock components. L. P. Evans in 2,794,771 (to Socony Mobil Oil Co.) discloses a method and apparatus for treating a heavy oil with an inert contact material at such pretreatment conditions of temperature and pressure as to produce separate streams of vaporized virgin oil for subsequent catalytic cracking and thermally cracked stock.

A hydrocarbon charge stock containing appreciable amounts of deleterious material, such as sulfur compounds or nitrogen bases is, according to T. Rice's 2,767,126 (to Gulf Research & Dev. Company), contacted in a first reaction zone under mild conditions with partially regenerated fluid cracking catalyst, obtained from the upper portion of a regeneration zone. Cracked products from the first reaction zone are contacted in a second reaction zone under conventional cracking conditions with regenerated fluidized catalyst, obtained from a lower portion of the regeneration zone. Spent catalyst from each of the reaction zones is continuously passed to the upper part of the regenerator and an oxidizing gas passed upwardly through the regenerator. In another Gulf Research & Dev. Company patent (2,801,208) W. A. Horne and C. W. Montgomery discuss conversion of a crude oil bottoms fraction to catalytic cracking feed stock with simultaneous desulfurization. The fraction is contacted with hydrogen over a nickel oxide-tungsten oxide catalyst at 775-880°F and 200-2000 psig pressure. A space rate of 0.5-1 V/V/hr. and a contact time of 4-16 hours are employed. The catalyst is then regenerated by combustion. According to Esso Research & Eng. Company's 2,775,544 (H. G. Corneil, R. J. Manne, G. R. L. Shepherd and A. M. Souby) a total or a reduced crude is hydrodesulfurized. Gas oil is then removed by distillation and the remaining product is subjected to deasphaltizing conditions in the presence of a liquefied, normally gaseous hydrocarbon to obtain a secondary gas oil fraction. The two gas oil fractions are combined and charged to catalytic cracking.

Two Standard Oil Co. of Indiana patents deal with the removal of deleterious nitrogen compounds from catalytic cracking feed stocks. W. D. Schmidt (2,796,387; see accompanying drawing and compare with drawing on page 125 of World Petroleum, Vol. 28, No. 8, July 15, 1957) contacts the oil simultaneously with a selective solvent and with between 0.05 and 0.5 gram moles of a Friedel-Crafts halide per gram atom of nitrogen. The amount of selective solvent is slightly in excess of that required to produce separate extract and raffinate phases. The purified oil is in the raffinate phase. W. A. Junk, Jr., W. D. Schmidt and H. S. Seelig (2,800,427) simultaneously contact the gas oil with: (a) a liquid selective solvent, such as SO_2, phenol, cresol, dimethylformamide, etc., and (b) an acid, such as HCl, H_2SO_4, sulfurous, sulfonic, trichloracetic acid, etc. Between 0.005 and 0.5% acid (based on gas oil) is used and enough solvent to produce a separate extract phase.

Hydrogen Donor Cracking: A group of Esso Research & Engineering Co. patents deals with this, relatively new process. H. G. M. Fischer (2,772,213) catalytically cracks heavy distillate oils. A cycle stock from the product is partially hydrogenated to obtain a hydrogen donor diluent. This is admixed with relatively heavy oil and cracked thermally. Gas oils from the thermal cracking step, including spent hydrogen donor diluent are separated and charged to catalytic cracking. J. Stewart and G. G. Wanless (2,772,222) mix a gas oil feed with 1-5 vols. of a hydrogen donor diluent and a recycled bottoms fraction. The hydrogen donor diluent comprises partially hydrogenated polynuclear aromatics in the range 650-950°F, derived from a heavy thermal tar. The mixture is thermally cracked at 800-1000°F and 300-2000 psig pressure and is separated. Gasoline is reformed and hydrogen produced is used to catalytically hydrogenate the diluent fraction. In 2,791,-541 C. E. Thompson, J. Stewart and A. W. Langer, Jr. describe a hydrogen donor conversion process, in which 0.2 to 2 vols. of diluent are mixed with each volume of heavy oil. Cracking is at 700-1000°F, 14-800 psig and at a feed rate of 0.25 to 0.5 V/V/hr. According to R. P. Cahn's 2,796,386 a hydrogen donor diluent is admixed with a hydrogen deficient oil and the resulting mixture is subjected to liquid phase thermal cracking in the lower portion of a reaction vessel. Vaporous reaction products are continuously passed upwards through the vessel. Hydrogen is introduced into the reaction mixture and passed through the tower with the vapors. The gas mixture goes through a catalytic hydrogenation zone and is then fractionated. The highest boiling fraction is recycled as regenerated diluent.

Cracking Technology—(a) *General:* The production of hydrogen and carbon from hydrocarbon gases from methane to butane is described in Houdry Process Corp.'s 2,760,847 (A. G. Oblad, T. H. Milliken and E. R. Boedeker). The carbon formed is easily removed. The charge gases are contacted at 1200-2000°F with an atomized stream of molten metal, containing 1-10% of a dehydrogenation metal catalyst, such as iron, cobalt, nickel, chromium, molybdenum or platinum. The metal should have a melting point of 445-1220°F.

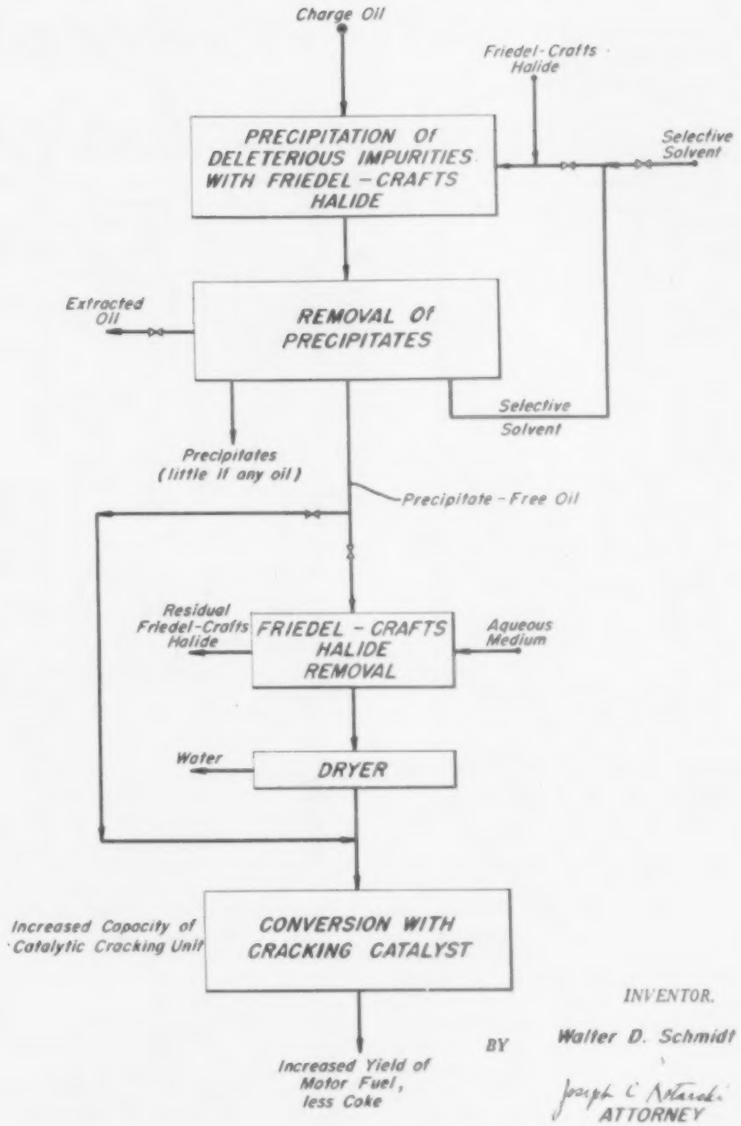
J. W. Scott (2,751,334 to California Research Corp.) converts heavy feed stocks to vaprous products and relatively little coke above Conradson carbon by continuously spraying liquid feed into central part

of a whirling body of hot gases, which are introduced tangentially into the periphery of the generally cylindrical reaction zone. The spray particles are rapidly picked up by the gases and carried outward by centrifugal force towards the periphery of the reactor through progressively hotter gases. Volatilized products are axially withdrawn along with retort gases. According to Sun Oil Co.'s 2,782,145 (S. W. Ferris), a residual fraction and a petroleum paraffinic naphtha boiling between 375-500°F are converted to gasoline hydrocarbons and gas without concomitant coke formation by: (1) heating the residue to a temperature below that at which coke is formed, (2) heating an aromatic fraction to 1000-1300°F, (3) heating the paraffinic fraction to 675-900°F, and (4) simultaneously contacting the three.

Two Gulf Research & Dev. Co. patents deal with catalytic cracking. In 2,782,144 W. A. Pardee discusses the preparation of a cracking catalyst by immersing a calcined silica-alumina cracking catalyst composite in an aqueous solution of ammonia, removing ammonia from the composite, and calcining the composite at 1400°F. C. D. Ackerman and R. E. Donaldson (2,790,753) are concerned with the recovery of the catalyst from a fluidized catalytic cracking process. A heavy fraction of reaction products is condensed, which will contain all entrained catalyst. Aromatics in this fraction are extracted with a solvent of a specific gravity lower than the specific gravity of the high boiling fraction. The raffinate, containing entrained catalyst, is recycled.

Hydrocracking applications are the subject of two patents. N. F. Kubicek and R. C. Archibald in Shell Dev. Co.'s 2,792,336 improve the total product values produced by the catalytic cracking of hydrogenated feed stocks, by using the limited supply of hydrogen to hydrogenate certain portions of the feed quite deeply rather than to hydrogenate a broader range less deeply. Heavier fractions of the virgin oil are more deeply hydrogenated. H. Heinemann and J. W. Wetzel (2,766,306 to Houdry Process Corp.) produce aromatic monocyclic hydrocarbons from aromatic polycyclic hydrocarbons by subjecting a charge stock rich in the latter to hydrocracking at 800-1000°F under a hydrogen partial pressure of at least 1000 psig in the presence of a catalyst comprising a siliceous cracking component intimately combined with a minor quantity of nickel. The catalyst contains 2.5-15 millimols of nickel per milliequivalent chemisorption capacity of the cracking component.

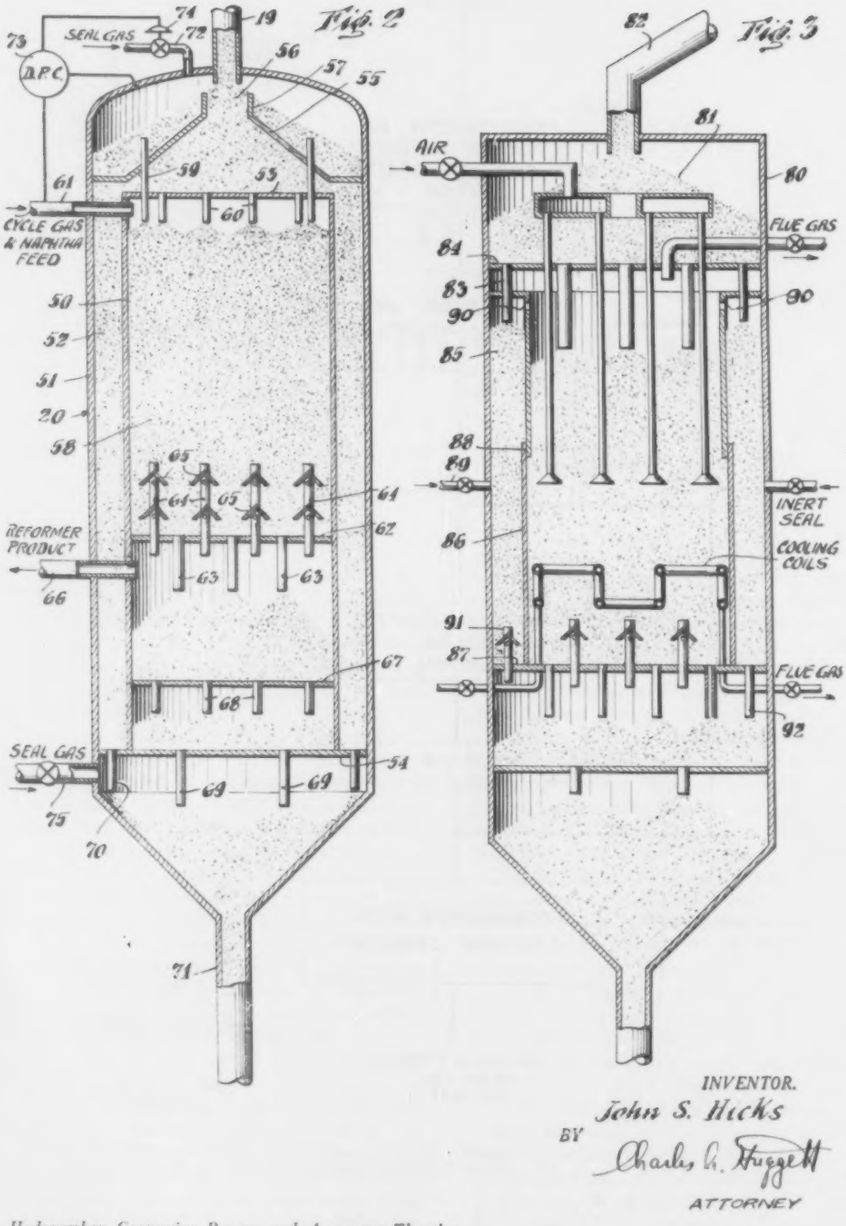
(b) *Moving Bed Technology:* A system of liquid-solid contacting is described in M. M. Yurko's patent 2,758,070 (to Socony Mobil Oil Co.). Liquid is passed upwardly through a bed of granular solids in a confined contacting zone. Liquid is withdrawn from the contacting zone by means of a substantially horizontal passage extending across the upper section of the contacting zone. It enters the passage by means of a plurality of horizontally spaced apart openings intermediate the top and bottom of the passage. In another Socony Mobil Oil Co. patent (2,748,060) J. J. Hicks discloses a moving bed reactor for high temperatures (see accompanying figure). A single solid stream of contact material is split into two streams, with part being directed through a central reaction zone and the other part through an annular heat insulation zone. Later the two streams are recombined. The solid material in the annular zone flows at a fraction of the rate of material in the reactor zone and acts as insulation.



Catalytic Cracking of Preheated Hydrocarbon Oils, USA Patent 2,796,387, dated June 18, 1957, to W. D. Schmidt.

A group of Houdry Process Corp. patents deals with problems of catalyst handling in a moving bed unit. R. Kollgaard in 2,775,548 partially regenerates the catalyst after it leaves the reaction zone. The catalyst is then lifted in a pneumatic lift to the top of the unit and is fully regenerated in a zone above the reaction zone. Patent 2,781,300 (A. W. Hoge) discloses a way of overcoming the problem of thermal shock to a make-up catalyst added to the moving bed system. The make-up feed line is placed into the elutriator and its outlet is within the cone of active catalyst flow in the bed of catalyst in the elutriator. D. B. Ardern and R. M. Shirk propose in 2,775,547 a process and apparatus for removing catalyst fines from a moving bed cracking unit, while R. Kollgaard in 2,760,843 discusses apparatus and methods for introducing fresh make-up catalyst to the unit and for preheating the catalyst.

A method for controlled withdrawal of granular solids from a confined liquid-solid granular contacting zone is the subject of



Hydrocarbon Conversion Process and Apparatus Therefor, USA Patent 2,748,060, dated May 29, 1956, to J. S. Hicks.

Socony-Mobil Oil Co.'s 2,783,189 (E. V. Bergstrom and H. W. Shea).

Two patents deal with the introduction of fluids into the moving bed unit. W. W. Weinrich (2,800,432 to Houdry Process Corp.) discharges hydrocarbons, at least partially in the liquid state, into contact material moving upwards in an unobstructed path below the entrance of the lift conduit and in a region, wherein a relatively high concentration of contact material exists. S. C. Eastwood (2,798,029 to Socony Mobil Oil Co.) discloses a method and apparatus for the introduction of contact material and fluid reactants to a downwardly moving bed of granular contact material. Uniform distribution of contact material and reactants across the horizontal cross-section of the bed is achieved. E. V. Bergstrom in Socony Mobil Oil Co.'s 2,808,-367 proposes a method of correcting nonuniformity of bed temperatures.

Coking: Esso Research & Engineering Co. is the assignee of a large group of patents in this field. J. W. Brown in 2,796,391 describes a fluidized coking process. In 2,789,-082 F. T. Barr, J. W. Brown and C. E. Jahnig propose a coking process wherein the resultant vapors or vapor products are cracked in contact with a dense, fluidized catalyst. Because many oils contain catalyst contaminants, vapors rising from the coking zone are scrubbed and partially condensed by contact with cool liquid hydrocarbons to remove heavy constituents, including contaminants, before the coked products reach the fluidized bed of catalyst. C. N. Kimberlin and C. E. Adams (2,768,127) convert heavy residues to lower boiling products rich in unsaturates and aromatics by contact with subdivided solids at coking conditions of 1200-1400°F in the absence of steam. The contact is accomplished in a fluid bed reactor using light hydrocarbon gases as a fluidizing medium. G. A. Beiswenger (2,791,547) avoids agglomeration of finely divided solids in the high temperature fluid coking of heavy carbonaceous residues by adding a comparatively low boiling miscible liquid to the material being coked. Atomization of the residue is facilitated by flashing and vaporizing of the added low boiling miscible material. C. E. Jahnig (2,791,549) describes equipment and methods to prevent the coking of hydrocarbon vapors withdrawn from a fluid coker.

A coking process to produce coke and gaseous, unsaturated hydrocarbons having less than 4 C atoms/mole from residues is disclosed in 2,789,084 (A. H. Schutte to the Lummus Co.). Coke particles are moved by gravity through a liquid phase cracking zone. Vapors produced are passed to a separate bed or zone, which is essentially shallow and adopted to produce short-time vapor cracking at 1200-2600°F. In accordance with Sinclair Refining Co.'s 2,761,825 (T. H. Schultz), a heavy oil charge stock is coked in the presence of a body of coke particles, maintained in fluidized state, at high coking temperature. A substantial amount of the heat for the coking reaction is supplied by a hot, olefin rich, gaseous hydrocarbon stream serving as a fluidizing medium. This stream possesses high sensible heat and has an exothermic heat of polymerization. C. K. Mader (2,780,586 to The M. W. Kellogg Co.) cokes a heavy oil by wetting the surface of a bed of coke granules maintained in a fluidized state by the passage of combustion gases.

Coking of solid carbonaceous material at high temperature is disclosed by J. R. Murphy and J. K. Darwin (2,807,571 to Gulf Research & Dev. Co.). Solid carbonaceous material and hot coke particles are fed tangentially into a reactor above the dense phase level of a first fluidized bed of coke particles. Volatile components liberated from the charge stock pass through a second fluidized bed of hot coke particles. Coke particles are withdrawn from the first fluidized bed and transferred to the second fluidized bed, in which coking is completed.

Chemicals from Cracking: The production of diisopropyl is the subject of Phillips Petroleum Co.'s 2,803,684 (F. E. Frey and H. J. Hepp). Hydrocarbons are cracked to aromatics in a pebble heater at 1475-1675°F and isobutane is alkylated with the cracked gases in the presence of aluminum chloride catalyst. Little or no purification of the alkylation product is required. END

Petrochemical monomers for the synthetic rubber industry

PART III PRODUCTION METHODS

by Peter W. Sherwood
Chemical Engineer, White Plains, N. Y.

This is the last in a series of three related articles by the author. Parts I and II appeared in September and November.

In Part II of this series, we covered the production of isobutylene, butadiene, and styrene—chemicals derived directly from petroleum hydrocarbons. The present installment is concerned with the manufacture of acrylonitrile and chloroprene. The manufacture of both of these monomers from petroleum sources takes an indirect route.

Acetylene is the common intermediate for both acrylonitrile and chloroprene. This hydrocarbon is obtained principally from calcium carbide, but its manufacture from methane—as well as from higher-boiling paraffins—is on the uptrend. Methane-derived acetylene is already employed in the production of acrylonitrile, and offers an attractive potential for future chloroprene expansion.

Another methane derivative—hydrogen cyanide—serves as starting material in the synthesis of acrylonitrile. It is obtained by the partial combustion of a methane-ammonia mixture. In its own turn, ammonia is a derivative of methane, which is the raw material for 95% of the hydrogen employed in the fixation of nitrogen.

The remaining discussion will be concerned with the technology of manufacturing the two petrochemical intermediates acetylene and hydrogen cyanide, as well as with an account of commercial methods of acrylonitrile and chloroprene synthesis.

A. Production of Acetylene: Methane is converted to acetylene by a highly endothermic reaction which occurs at high temperatures, as in equation (1):

$$2CH_4 + 174{,}000\ \text{Btu} \rightarrow C_2H_2 + 3H_2\ (\text{at } 1{,}250\ C) \quad \ldots\ldots (1)$$

At the temperatures involved, the reaction product is highly unstable. In order to obtain tolerable yield, therefore, it is necessary to limit residence time in the high-temperature zone to approximately 3/1,000 sec.—following which the product is quenched.

Three methods are available for providing the large heat requirements of the reaction in the short available time. These are: (1) use of electric arc or spark; (2) regenerative heat exchange in which the process gas is contacted with preheated ceramic surfaces; and (3) partial combustion in which a portion of the feed methane serves as fuel.

An electric-arc process has been employed on a commercial scale at Huels, Germany, for about 15 years now. Processes of this type show about the same electric consumption as the manufacture of acetylene via calcium carbide. They are, therefore, made attractive only by an unusual combination of circumstances, and are not employed commercially in the United States.

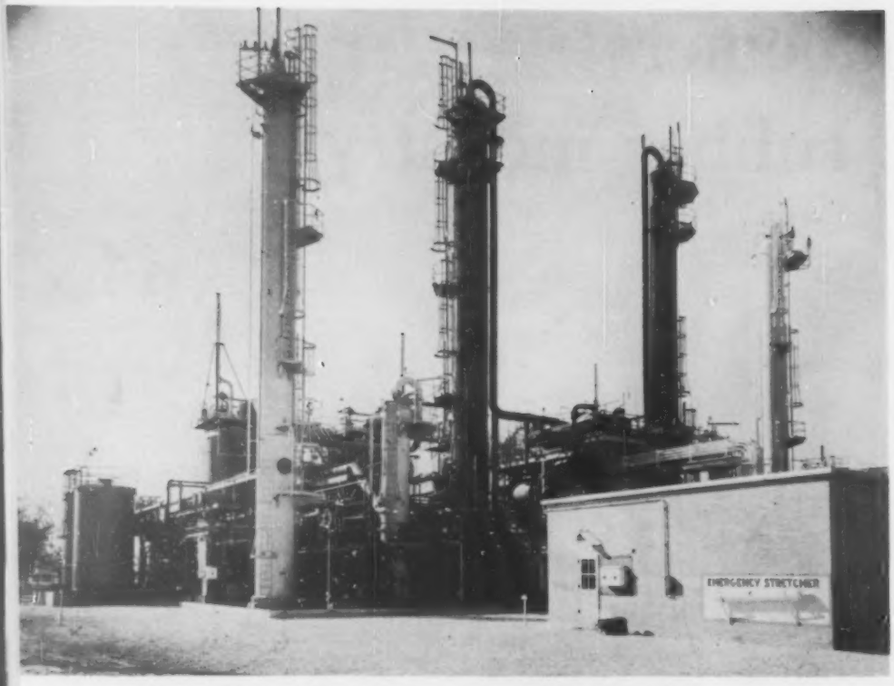
Several regenerative processes have been developed for acetylene generations from methane. Much publicity has been given to the Wulff process in which methane passes through ¼-in. passages in a ceramic furnace. The unit is operated cyclically, alternating between methane cracking (for acetylene production) and methane combustion (to provide heat which is stored in the furnace's ceramic material for use during the make period).

The Wulff process is used for acetylene production only at a semi-commercial demonstration plant. A modification of the cracking furnace itself does, however, find commercial use in the reforming of natural gas (i.e., reaction with steam to yield a mixture of carbon monoxide and hydrogen).

Other regenerative processes are employed for the simultaneous production of acetylene and ethylene—with emphasis on the latter. Here, the feed stock is ethane, propane, or butane. Carbide & Carbon's plant at Torrance, Calif., uses this approach to crack refinery gas to ethylene plus acetylene. The same course is also chosen for Phillips hydrocarbon pyrolysis plant which is currently under construction at Sweeny, Texas. This plant, incidentally, will employ a moving-bed regenerative process in which pebbles serve as heat carrier from combustion zone to reaction chamber.

Partial combustion of methane is the route chosen at all USA installations for the conversion of methane to acetylene. At this writing, the method is employed by three producers (Carbide, Monsanto, American Cyanimide). Other such units are being constructed by Dow Chemical Co. (at Freeport, Texas) and Rohm & Haas Co. (Houston, Texas). Still in the survey stage is an acetylene-from-methane plant for Grace Chemical Co., while announced plans for a methane pyrolysis plant for Diamond Chemical Co. are currently held in abeyance.

In favor of the partial oxidation process are a high degree of development and commercial know-how. On the economic side, the method benefits from the forma-



Synthesis Section of the Acrylonitrile Plant of American Cyanamid Co.

Purification Section of American Cyanamid Co.'s Fortier, La., Installation for Acrylonitrile Production. (All photos in this section by courtesy of American Cyanamid Co.)

tion of byproduct synthesis gas (a mixture of carbon monoxide and hydrogen) which figures in the synthetic of ammonia, methanol, and oxo-chemicals.

The greatest amount of experience has been acquired in the design and operation of the so-called Sachsse process, a partial combustion method developed by BASF. Details of this process have been discussed by the author in a recent paper[1].

Feed to this process is a mixture of 95% oxygen ("tonnage" oxygen) and methane in a ratio of 0.56. The two gases are separtely preheated to 600 C, and are joined in an especially designed mixing zone atop the burner in which the reaction proper takes place.

Partial combustion—which occurs in the reaction zone—raises the flame temperature to a peak of 1,200 C. By maintaining very high linear flow rates, residence time in the high-temperature range is restricted to its optimum value of about 0.002 sec before the process stream is quenched to 80 C by water injection into the nether part of the burner.

On a dry basis, the burner gas contains some 8% to 9% acetylene, 24% to 26% carbon monoxide, and 56% hydrogen. The remainder is made up of CO_2, unconverted methane, plus some higher hydrocarbons, nitrogen, and argon. It also contains some soot (about 0.5 to 1.0 lb per mcf feed gas) which is removed in an especially designed coke filter.

The cleaned gas is compressed to 105 psig, and is scrubbed for the removal of acetylene. A number of solvents (among them acetone, acetonyl acetone, dimethyl formamide) are useful in this application. Choice in the Sachsse process has never been announced, but it is most probably gamma-butyrolactone containing 2% to 5% water. The tail gas leaving the scrubber has been depleted of more than 99% of initial acetylene content, and constitutes a slightly diluted synthesis gas which may serve as feed gas to other chemical operations.

The fat absorber liquor is taken to a stripper column which is operated at atmospheric pressure. Some acetylene is injected into the tower bottom to remove dissolved carbon dioxide. Acetylene of 99.8% purity is withdrawn as a side stream.

The stripped liquor must still be freed of certain contaminants (notably diacetylene) which is absorbed, along with acetylene, in scrubbing the reactor gas. Toward this end, the liquor is fed to a rectification tower, operated at 3 psia and 100 C. At these conditions, residual acetylene and contained contaminants are stripped off. An impure grade of acetylene is removed overhead and recycled to the primary stripper column. A concentrated stream of diacetylene and other contaminants is withdrawn at an intermediate point of the tower, and is water-washed for recovery of contained solvent.

In this process, the production of 1 lb acetylene consumes 116 SCF natural gas, and 5.2 lb byproduct is 180 SCF tail gas, which contains nearly 90% carbon monoxide plus hydrogen.

Of late, other partial combustion processes for generation of acetylene from methane have come into the limelight. Special interest attaches in this connection to techniques developed by Société Bélge de l'Azote. Its burner differs from the Sachsse reactor in providing a sheet of water which flows parallel to the gas stream. Purpose is to minimize carbon deposition on the burner walls—which is particularly troublesome in the partial combustion of hydrocarbons higher than methane. SBA's process employs a metallic burner, while ceramic construction material is used in the conventional Sachsse reactor.

For the absorptive recovery of acetylene from the burner gas, SBA uses liquid ammonia as solvent. The gas is first washed for the removal of CO_2. It is then scrubbed with methanol to eliminate moisture and aromatic hydrocarbons. Finally it enters an absorption tower in which liquid ammonia serves to scrub out contained acetylene.

A number of other processes for the production of acetylene from petroleum hydrocarbons have been developed through the pilot-plant stage in recent years. Among them we might mention Hoechst's pyrolysis of naphtha in which hydrogen-rich tail gas is burned with oxygen to supply fuel requirements (presumably in indirect heat exchange). Acetylene yield is reported to be 50% to 60%. Combined yield of acetylene plus ethylene is reported to give an overall efficiency of nearly 90%.

Use of methanol for the recovery of acetylene from burner gases has been developed by Italy's Montecetini. The absorption is carried out at 14 atmospheres and −70 C. A mixture of acetylene and CO_2 is stripped from the solvent at 20 C. A caustic wash will remove carbon dioxide from the acetylene product.

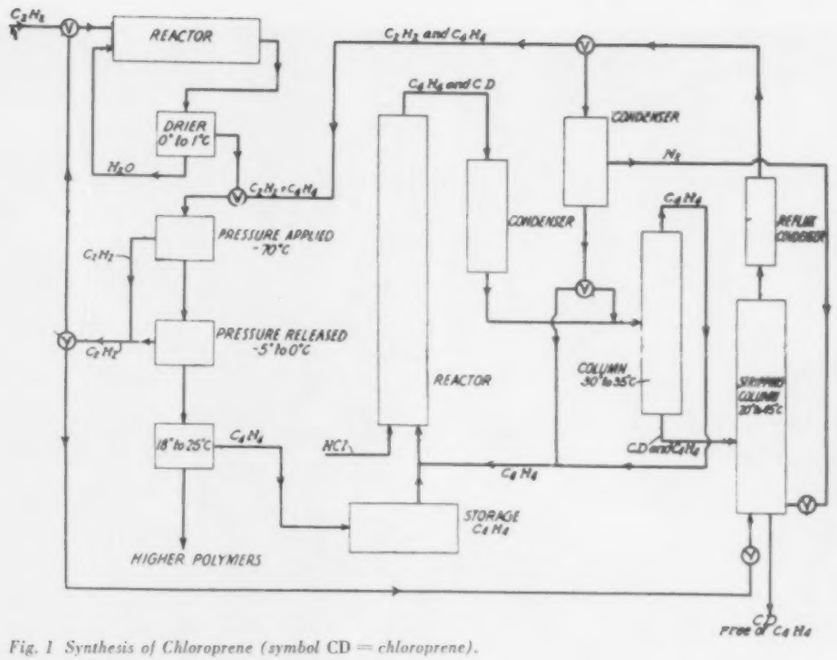


Fig. 1 Synthesis of Chloroprene (symbol CD = chloroprene).

Use of methanol and ammonia has the advantage of lower solvent cost when compared with conventional scrubbing media (gamma-butyrolactone, acetonyl acetone). This is largely offset by refrigeration required to operate at the low temperatures at which methanol and ammonia are effective solvents for acetylene.

B. Production of Hydrogen Cyanide: Hydrogen cyanide is a raw material in the manufacture of acrylonitrile as well as of a number of other industrially important nitriles and acrylates. It is produced by three commercial routes: direct recovery from coke-oven gas, reaction of sodium cyanide with sulfuric acid, and partial combustion of a methane-ammonia mixture.

Only the last-named of these processes may be deemed to be of petrochemical character. It accounts for the overwhelming bulk of hydrogen cyanide produced in the United States. Our discussion, therefore, will be confined to techniques employed in the operation of this process for the manufacture of hydrogen cyanide.

Theoretically, the presence of oxygen is not required to effect the conversion of ammonia plus methane to hydrogen cyanide and hydrogen. In the laboratory, this reaction has been carried out using external heating to supply the endothermic heat requirements.

In practice, there is, however, a twofold advantage to mixing air with the reactants. By so doing, byproduct hydrogen is consumed—shifting the reaction equilibrium in favor of more complete HCN formation. At the same time, the combustion of hydrogen (and some methane) is more than ample to supply the heat requirements of the conversion. In net effect, therefore, we obtain the highly exothermic reaction shown as equation (2):

$$2CH_4 + 3O_2 + 2NH_3 \rightarrow 2HCN + 6H_2O + 113.3 \text{ k-cal.} \quad \ldots(2)$$

This synthesis is carried out catalytically at 1,200 C to 1,300 C peak temperature. On theoretical grounds, any catalyst may be used which serves effectively at somewhat lower temperatures for the oxidation of ammonia to nitric acid and, in practice, very similar catalyst systems and conversion chambers are employed for both processes.

Practicable yields are obtained only by the use of platinum and some of its alloys (with iridium or rhodium). The catalyst is provided in the form of a fine-meshed gauze through which the reaction gases are passed. It is commonly preheated to operating temperature by electrical means. Once this temperature has been reacted, it is maintained at the proper level by the exothermic heat of reaction.

The burner feed is a gas mixture containing about 11.5% to 12.5% ammonia. Enough methane is present to provide a $CH_4 : NH_3$ ratio between 1.06 and 1.09. The remainder is air. The absence of dust particles, as well as of oil, must be insured to avoid premature catalyst deterioration (at proper conditions, onstream life of more than 2,000 hours is obtained). For the same reason, ethane and higher hydrocarbons should be absent from the feed gas because of their tendency to form soot which will obstruct the catalyst gauge.

To insure absence of dust and oil from its feed ammonia and air, one commercial installation even goes to the extreme of preparing the reactor mixture by passing air through aqueous ammonia and joining the resulting stream by methane.

Useful conversion in a single pass is limited to about 60% to 67% of the ammonia, 53% of the methane. The majority of installations employ sulfuric-acid scrubbing for ammonia removal from the product gas, and no recycle is, therefore, possible in such instances. However, as we shall see below, at least one industrially attractive process has been developed which permits recovery of unconverted ammonia so that it may be made to yield HCN with an ultimate efficiency approaching 85%.

Upon leaving the catalytic burner, the gases are quickly cooled to minimize subsequent decomposition reactions. The heat exchange is carried out in a waste-heat boiler, and raises some 6 lb to 7 lb steam per pound HCN.

At this point, the raw gas contains some 6% hydrogen cyanide, 1.6% ammonia, 4.5% carbon monoxide, 7.5% hydrogen. The balance is mainly nitrogen and water vapor plus some unconverted methane and oxygen, and some carbon dioxide. In most commercial installations, this process stream is washed with an aqueous solution of ammonium sulfate and sulfuric acid. Residual ammonia in the gas is thereby converted to ammonium sulfate, which is eventually recovered by crystallization.

The ammonia-free gas is scrubbed in a second tower with slightly acidified water which will absorb HCN to a concentration of 20% in the effluent liquor. The sorbate is removed in a stripper column. The overhead of this tower is hydrogen cyanide of higher than 98.5% purity. This is liquefied and stored at 5 C in the presence of a stabilizer to prevent spontaneous—and explosive—polymerization of the hydrogen cyanide. Commonly employed as inhibitor is phosphoric acid in a concentration of 0.2% by weight.

In this process, the production of 1 lb HCN consumes 1.05 lb to 1.08 lb methane and 1.05 lb ammonia. Since effective ammonia recovery (as ammonium sulfate) is about 0.31 lb, its net consumption is 0.74 lb per pound HCN.

A process has recently been developed by which unconverted ammonia can be separated as such from HCN in the product stream. This permits unused ammonia to be recycled, and frees the manufacturer from the need to dispose of byproduct ammonium sulfate.

In this method, the scrubbing medium for raw reactor gas is an aqueous solution of 8.3% by weight of pentaerythritol and 2.5% by weight of boric acid. This solution will take up both hydrogen cyanide and ammonia; but, while the former is merely dissolved, the latter forms a semi-stable salt with the polyhydroxy-boric acid complex.

Hydrogen cyanide may be removed from the solution by vacuum stripping at 80 C to

Methods for making a new antiknock compound are investigated by an Ethyl research chemist.

How Ethyl Chemical Research Advances Antiknock Technology

Break-throughs in Organo-Metallic Chemistry Point to More Effective Antiknock Agents and New Tetraethyllead Production Methods

EVER SINCE the discovery of tetraethyllead as the first practical antiknock additive, Ethyl scientists have been searching for even more effective and economical antiknock agents.

Extensive research on both organic and metal-organic materials in our Detroit Research Laboratories has shown that the metals are the most promising. Our research also has shown that these materials promise important new advances in tetraethyllead production methods.

Our efforts to learn more about organo-metallic compounds also have enabled us to make significant contributions to chemical knowledge outside the antiknock field. Ethyl's continuing publication of such information contributes to the expansion of knowledge in this field of chemistry.

Developments in Organo-Metallic Chemistry Offer Antiknock Promise

Much of the early work on metallic antiknocks was hindered by the lack of compounds with solubility, volatility, and stability characteristics suitable for use in gasoline.

Recent break-throughs in chemical knowledge, which were used to good advantage by Ethyl scientists, have indicated that a wide variety of metals might be incorporated in organic compounds. The synthesis of organo-metallic compounds with suitable physical characteristics has enabled us to consider a number of them as antiknock possibilities.

One organic manganese compound, which we call AK-33X, shows definite promise of increasing the power output of piston aircraft engines, when AK-33X is used as a supplement to tetraethyllead. Extensive tests now are being made to determine its effectiveness for automotive use both as a supplement to tetraethyllead and as a primary antiknock.

High-pressure autoclaves in Ethyl's Baton Rogue and Detroit Laboratories are used to run organo-metallic reactions at high pressures and temperatures.

Tetraethyllead Is Synthesized From Common Lead Compounds

Another recent accomplishment of Ethyl's organo-metallic research is a new method of synthesizing tetraethyllead from a wide range of organo-metallic compounds by reacting them with common lead compounds such as lead oxide, lead sulfide, and lead dioxide. This radical departure from present technology circumvents the use of sodium and chlorine.

Major development work remains to be done before this new method can be used commercially. However, our studies of all phases so far have led us to believe that considerable advances in tetraethyllead production methods are within reach.

Chemical Contributions Outside Antiknock Field

An added benefit of the synthesis of tetraethyllead and other organo-metallic compounds is the development in our laboratory of improved techniques for manufacturing triethyl aluminum. This compound is of high interest as a possible new route to the manufacture of tetraethyllead.

Triethyl aluminum also is important as an ingredient in catalysts for olefinic polymers and particularly high density polyethylene, as an alkylation agent for active metals and less active salts, and as a reducing agent comparable to lithium aluminum hydride. Triethyl aluminum and trimethyl aluminum also are being considered for military fuel applications

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The Ethyl scientific team has a solid research background in fuel-engine relationships plus a comprehensive knowledge of organo-metallic chemistry.

In addition, the Research Laboratories are uniquely organized to evaluate the potential engine applications of new fuel or lubricant additives. These are good reasons why we look forward to even more important advancements in the fields of antiknock chemistry and organo-metallic research.

In so far as possible, data on all Ethyl's current research projects in antiknock technology and organo-metallic research will be made available to the Oil Industry.

How Ethyl Research is helping you

In the 36 years since the discovery of tetraethyllead as the first practical antiknock additive, Ethyl's search for new antiknock agents has continued.

New compounds and their value to the Petroleum and Chemical industries are investigated on a continuing basis in our laboratories in Detroit, Mich. and Baton Rouge, La.

Research in the field of organo-metallic chemistry is only one of the many facets of Ethyl's research program.

Ethyl's scientific manpower, experience and facilities are dedicated to the search for fundamental knowledge of the behavior of fuels and engines, guided by the needs of the Petroleum Industry.

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90 C. Ammonia is recovered from the HCN-free solution by desorption at 2 to 3 atmospheres and 130 C. The polyhydroxy-boric-acid solution is reconcentrated and recycled to the scrubbing stage. Overhead ammonia is freed of water by conventional means, and is then returned as feed to the hydrogen-cyanide reactor.

C. Production of Acrylonitrile: The preceding two sections are concerned with the production of two intermediates—acetylene and hydrogen cyanide. Their combination in the synthesis of acrylonitrile makes them important in the production of *N*-type synthetic rubber.

The reaction underlying this synthesis of acrylonitrile is shown as equation (3):

$$C_2H_2 + HCN \rightarrow CH_2=CH-CN \quad \ldots\ldots (3)$$

The reaction is carried out in the presence of a liquid catalyst. The active compound is cuprous chloride, which is dissolved in water. However, the solubility of this salt is low, and it must be raised by adding ammonium chloride or alkali-metal chlorides to the medium. Typically, one liter of fresh catalyst solution contains 650 g cuprous chloride, 350 g ammonium chloride, 560 ml water, and 20 ml concentrated muriatic acid.

Operating temperature in the converter is 80 C to 90 C; pressure is about 15 psig. Of importance is the ratio of reactants; optimum is found to be in the range of 8 to 10 moles acetylene per mole hydrogen cyanide. Almost complete conversion of the HCN is expected, and the concentration of this acid in the crude reactor product serves as criterion for the control of the operation.

The process scheme may be described in terms of the arrangement at one commercial installation. Here, the reactor is a vertical cylindrical brick-lined vessel, filled with catalyst solution. Acetylene is introduced through orifices in the converter's bottom. Liquid hydrogen cyanide is fed as a separate stream.

The gaseous reactor makes passes through a knockout drum, and from there into a water-washing column in which acrylonitrile is recovered as a 2% solution. The product-depleted gas is, for the most part, recycled to the converter. En route, it is joined by makeup acetylene.

The dilute acrylonitrile solution is taken to distillation. The overhead is the acrylonitrile-water azeotrope. Upon condensation, this will settle into two phases: The aqueous layer is returned to the distillation feed, while the organic layer is transferred to the acrylonitrile fractionation columns.

In the first stage in the acrylonitrile refining systems, acetylene and monovinyl-acetylene are removed by stripping. This is followed by stripping off light boilers (HCN, acetaldehyde, and some chloroprene). The bottoms from these steps are vacuum-distilled. The overhead is product acrylonitrile which, however, must still be freed of divinyl acetylene. The bottoms are principally lactonitrile, 1-cyanobutadiene, and higher nitriles. Residual acrylonitrile is recovered from this stream in a final distillation; is impure, and must be recycled.

In this process, acrylonitrile yield is 80% to 85% based on acetylene, and 90% to 95% on hydrogen cyanide.

The most serious purification problem in acrylonitrile production is the removal of divinyl acetylene which is formed as by-product. This contaminant is objectionable because of its deleterious effect on the properties of acrylonitrile polymers (especially in synthetic fibers). Removal from acrylonitrile by distillation is not feasible. The most effective method of elimination involves a chemical (chlorination) step which makes the operation costly.

Efforts, therefore, have been directed toward minimizing the formation of divinyl acetylene in the reactor. Much of this work has taken the direction of freeing the recycle acetylene stream of monovinyl acetylene which appears to be the starting point for most of the divinyl acetylene formed in the process.

One such approach, due to Zwilling[3], calls for washing the acetylene stream with sulfur-saturated gas oil. The reactor effluent is first water-washed in conventional manner for the removal of acrylonitrile. The lean gas is then fed to the midpoint of a packed column in which it is contacted with sulfur-saturated gas oil at 0 C to 10 C—thereby removing most of the monovinyl acetylene from recycle gas. The rich solution is degassed at 140 C to 150 C before it is re-used in the scrubber.

Zwilling claims that this removal of vinyl acetylene from the recycle stream will permit production of crude acrylonitrile which contains only 0.15% by weight of divinyl acetylene. Operation at similar conditions, but without scrubbing of recycle gas, would yield a product which contains 1.1% divinyl acetylene and 0.2% monovinyl acetylene.

Other means for removing MVA from the recycle stream include scrubbing with acrylonitrile at −10 C to +10 C. Various other solvents have also been proposed.

Another contaminant which is objectionable in product acrylonitrile, even in concentration as low as 700 ppm, is hydrogen cyanide or its derivative, lactonitrile. These two impurities may be removed almost quantitatively by treating the product with as little as 0.125% by weight of solid sodium hydroxide and then filtering the resulting slurry.

D. Production of Chloroprene: Chloroprene, the monomer of neoprene-type synthetic rubber, is obtained from acetylene and hydrochloric acid. Two reaction steps are involved in its commercial production: synthesis of monovinyl acetylene followed by hydrochlorination to chloroprene:

$$2CH\equiv CH \rightarrow CH\equiv C-CH=CH_2 \quad \ldots\ldots (4a)$$

$$CH\equiv C-CH=CH_2 + HCl \rightarrow CH_2=\underset{Cl}{C}-CH=CH_2 \quad \ldots\ldots (4b)$$

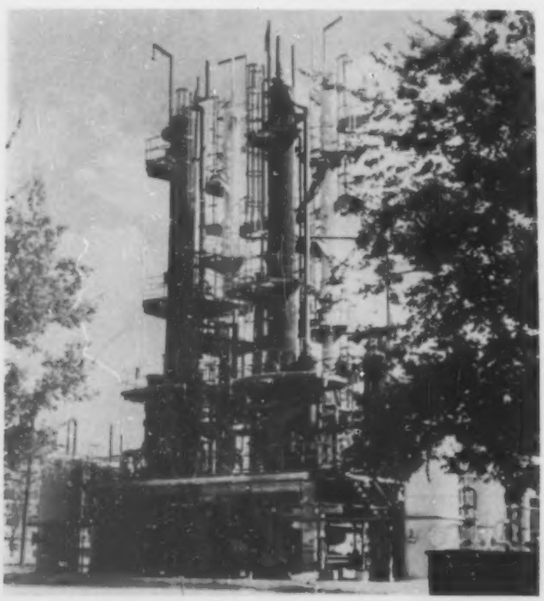
The dimerization of acetylene to monovinyl acetylene (MVA) is catalyzed by an aqueous solution of cuprous chloride and ammonium chloride, held at a pH above 6, i.e., a catalyst system similar to that described above for acrylonitrile synthesis.

The desired reaction is accompanied by the formation of byproduct, of which divinyl acetylene is the most prominent. Catalyst formulation and operating conditions are directed toward minimizing these yield-lowering side reactions.

The conversion can be carried out between 50 C and 100 C. From considerations of throughput rate, a high temperature is desirable, but the drawback of higher temperatures is a tendency toward increased formation of divinyl acetylene and other higher polymers of acetylene.

This adverse effect of higher temperature on monovinyl acetylene yield is reportedly not observed if the catalyst contains 2 moles ammonium chloride per mole cuprous chloride. The following tabulation shows the temperature sensitivity of this catalyst

Recovery Towers of American Cyanamid Co.'s Acrylonitrile Plant at Fortier, La.



IN CANADA: DIKKERS, LTD., SCARBOROUGH, ONTARIO

system, compared to one in which a lower NH_4Cl-Cu_2Cl_2 ratio is maintained[4]:

Catalyst System I
NH_4Cl—Cu_2Cl_2=1.3

Temperature	Conversion to MVA	MVA / DVA Ratio*
	%	
60	7.6	12
65	12.9	10
75	14.5	8.8

Catalyst System II
NH_4Cl—Cu_2Cl_2=2

Temperature	Conversion to MVA	MVA / DVA Ratio*
	%	
60	7.2	14.4
65	12.8	14
75	14.2	14.3

**DVA includes all products other than MVA.*

These data show that catalyst system No. II is clearly capable of providing much higher yield than system No. I. The slightly lower activity of the second catalyst is of secondary significance.

In the light of these data, Carter[4] recommends a catalyst consisting of 36% to 38% cuprous chloride, 19% to 21% ammonium chloride, 0.6% HCl, the remainder being water. This composition is approximately saturated at 65 C, and the catalyst is recommended for use at 65 C to 75 C.

Much of the byproduct formation is due to polymerization of monovinyl acetylene. It is, therefore, essential that this, the desired product, be not permitted to build up to high concentration in the reactor. To accomplish this objective, it is necessary to operate with low conversion per pass and to eliminate MVA from recycle gas.

Conversion per pass should not exceed 20%. To accomplish this, residence time in the catalytic converter is maintained below 15 sec, generally between 10 sec and 15 sec. Throughput per unit reactor volume can be increased without loss in yield by operating at elevated pressures. In the handling of acetylene, a limit of about 2 atmospheres is set by safety considerations unless elaborate precautions are taken.

Fig. 1 shows a flow scheme for chloroprene production from acetylene. In it, the MVA section is shown at the left side. It will be noted that the gaseous effluent is cooled in two stages. In the first of these, water and divinyl acetylene (plus higher boilers) are condensed at 0 C. The gas stream is then taken to a secondary condenser where monovinyl acetylene plus residual DVA are liquefied at −65 C to −75 C.

The low-temperature condensate is taken to a distillation column, operated at 18 C to 25 C. MVA is taken overhead.

In a variant (not shown in the flow scheme), the high boilers may be combined with DVA from the primary condenser and taken to a stripping column for overhead removal of residual MVA. An acetylene stream may serve as carrier gas, and it is recycled to the low-temperature condenser for recovery of its contained MVA.

The monovinyl acetylene (C_4H_4) make is taken to storage, and from there to the hydrochlorination section shown schematically at the right-hand side of Fig. 1.

The addition of HCl to monovinyl acetylene is carried out at 25 C to 50 C. It is catalyzed by aqueous cuprous-chloride solution. Typically, the solution will contain 17.5% Cu_2Cl_2 20% to 30% HCl, the remainder being water. Makeup HCl is provided in gaseous form. Yields are reported by Carothers[5] as follows:

Vinyl Acetylene Converted Per Pass	Chloroprene Yield (on MVA Consumed)
%	%
58.8	93.0
76.8	91.2
79.5	90.3
87.4	86.0

The reactor make is condensed and taken to a distillation column. Here, the bulk of vinyl acetylene is taken overhead to be recycled. The bottoms are introduced to a packed column in which an acetylene stream strips off residual MVA. This carrier stream is recycled to the recovery stage of the MVA production unit. Chloroprene leaves the bottom of the stripper column, and is stored in the presence of an inhibitor.

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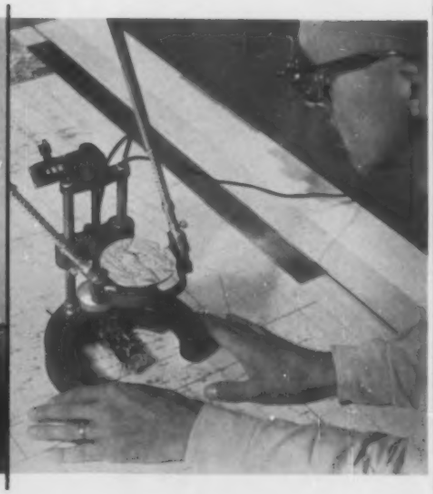

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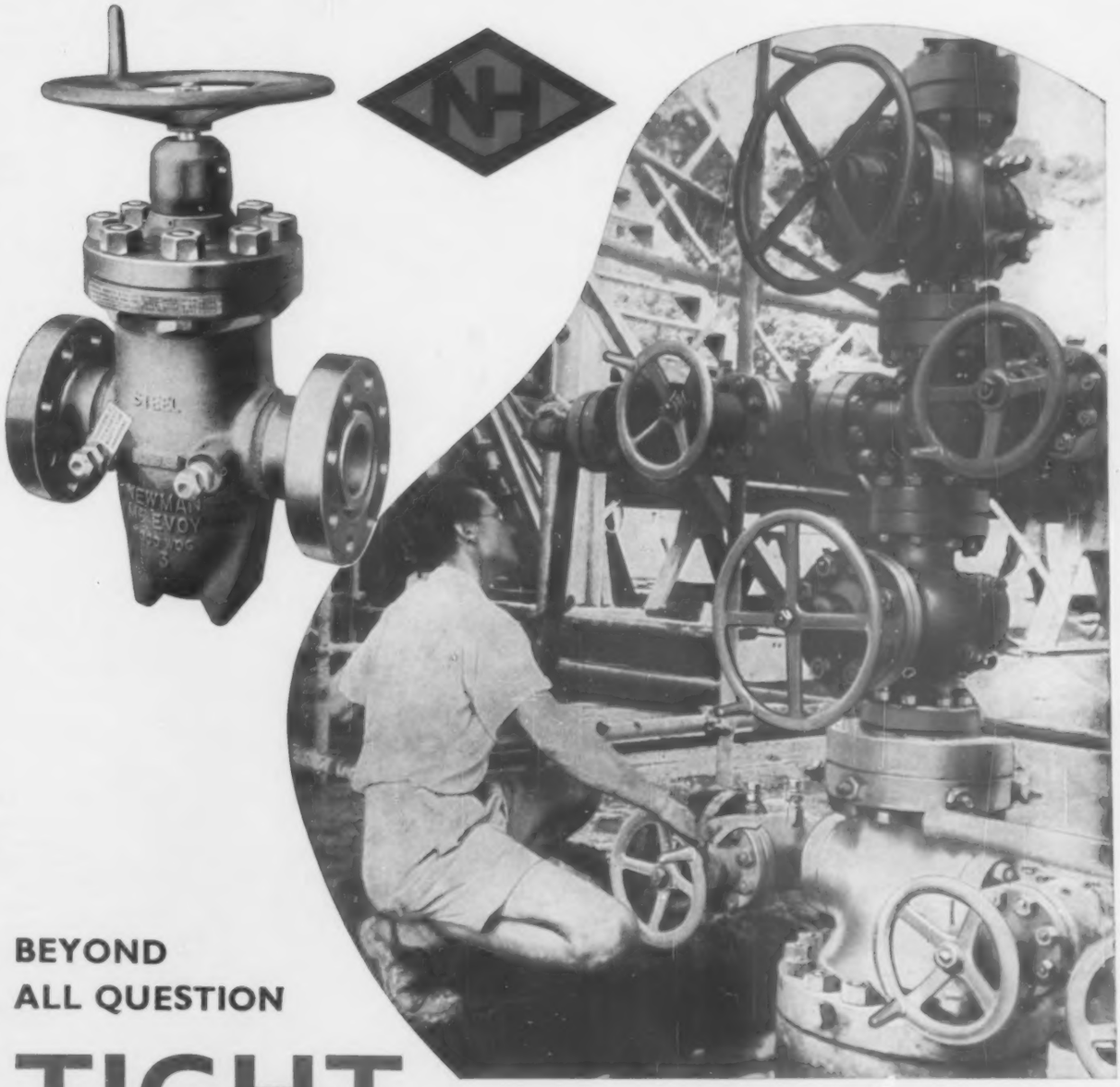

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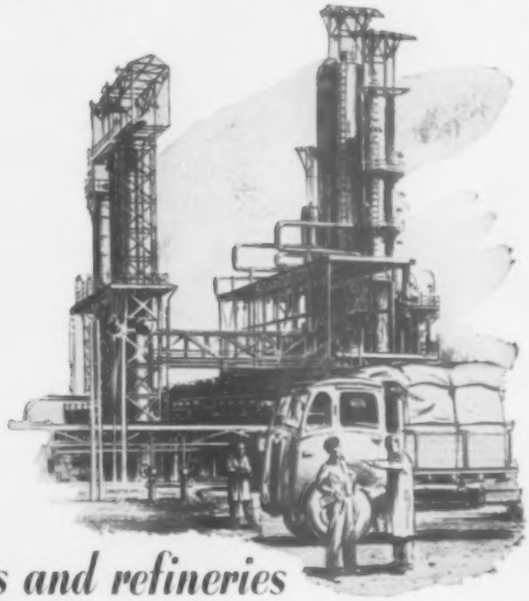

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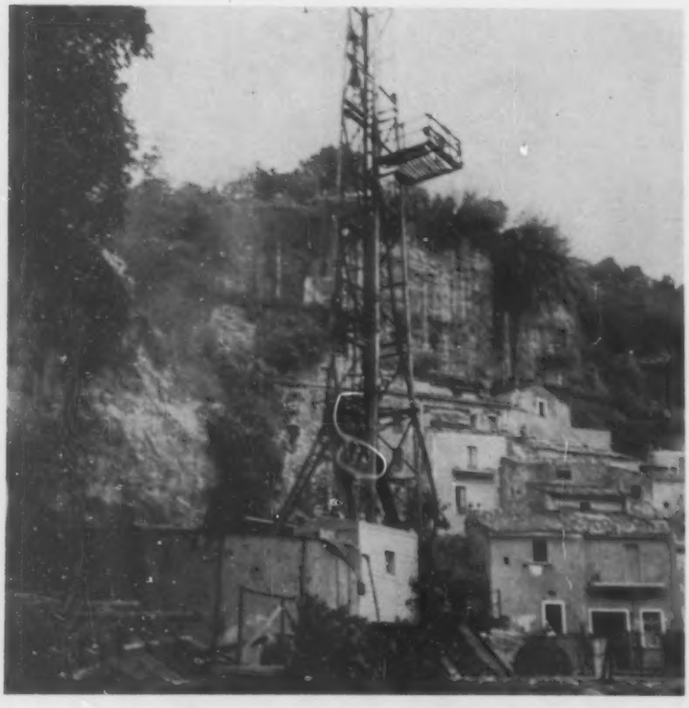

Ragusa Field Success

(*Continued from page 38*)

the field. A costly side of the operation is the government tax on the gas oil used to thin the crude, which AGIP has not been able to get abated even though it is a government operation.

East of Ragusa, at Rosolini, AGIP has a dolomite well which is reported capable of producing 1,200 b/d to 1,500 b/d of 15-gravity oil from a relatively thin section, about 58 ft. The well is believed to be on the flank of what may prove to be an important structure. Further drilling will be necessary to evaluate the find. At Ragusa, Gulf has adopted a policy of not producing any edge well with less than 300 ft of section above the water table, and AGIP may also find it desirable to step out from Rosolini No. 1. to find a thicker section. West of Ragusa, at Vittoria, British Petroleum Co's Italian subsidiary CISDA has found oil in the same formation. The oil is of 9 gravity. The company has had completion difficulties at this location; the well is not yet on production, and the value of the discovery is yet to be proved. Equipment now is being installed for a production test. It is planned to use gas oil as a diluent to facilitate lifting of the heavy crude in a manner similar to that being practiced at Gela.

CISDA has drilled a well to 5,000 ft with a light rig at Troitta, as a heavy rig was not available at the time. A heavy rig now is being moved in to continue the operation, and the light rig will be moved to San Pietro for a test.

South of the Ragusa field, Gulf Italia is currently drilling its sixth wildcat on this concession at Streppenosa. At the beginning of October the well was at 4,000 ft.

Since the close of World War II, 33 wildcats have been completed in Sicily, plus about 38 development wells in the gas fields and at Ragusa. Current activity on the island embraces about 20 operations, and indications are that 1958 drilling will continue at this or perhaps an even higher level. Sicily is now supplying a fifth of Italy's domestic oil requirements, and any possible increase in this level will greatly aid the national economy because of the current drain on foreign exchange to meet rising energy demands of Italian industry. END

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A Look Into Oil's Future

(continued from page 31)

strictions on its use during the crisis period—consumption for the first half 1957 actually increased 5% against the first half 1956.

Underlying this continued strong demand for distillates are several factors which have been emerging over the past several years. There has been a marked and continuing shift to the use of diesel-powered trucks and buses which now makes the use of distillate fuels for road transport the largest component of distillate demand, accounting for about one-third of the total. In recent years there has been a pronounced increase in the use of distillate fuel oil for home heating; about 22% of total distillate demand in 1956 was for this purpose. Large quantities of distillate fuels go into industrial consumption—about 16% of the total. Agricultural requirements, which are increasing, now take about 7% of the distillates. Marine uses—for coastwise, inland, and international bunkers—account for about 15%. The balance of the distillate use is divided about equally between railroads and other miscellaneous small users.

In the fields of industrial and heating usage, it is felt that there has been some slowing down in the growth rate as one result of the Suez crisis—for many of the same reasons which will be discussed more fully in the section covering residual fuels.

The combination of the foregoing factors, with differences in their respective rates of growth, results in a percentage growth rate anticipated for 1958 somewhat slower than has been observed over the past several years. The predictions in Table III show that demand in the first half 1958 will increase 18% above the depressed first half of 1957; and, while a healthy increase of 12% is indicated for the second half of 1957 over the similar period of 1956, the second half of 1958 is forecast to be only 6% higher.

The annual figures in Table III show how the rates of growth in distillate demand are slipping—from 19% in 1955, and 17% in 1956, to 9% in 1957 and only 12% increase in 1958 above the abnormally low 1957 figure.

Residual Fuel Oils (Excluding Refinery Fuel): Table IV shows clearly, by comparison with the tables for gasoline and distillates, that residual fuel oils now account for the largest part of the oil consumption in the Eastern Hemisphere—west of Suez. It is almost double the gasoline volume and about 1½ times the volume of distillate fuels.

Since the end of World War II residual fuel-oil demand has increased faster than that of any other major product. This has been due mainly to the inability of indigenous coal production and other local sources of energy to keep pace with Europe's industrial expansion and increasing need for all forms of energy. As a result, residual-fuel demand has been developing much faster than the growth of the economy as a whole.

When the Suez crisis hit, at the peak seasonal demand for residual fuel oil, the maintenance of supply of this product was of major concern to most European governments. Unlike gasoline, no stringent rationing program could be adopted. Effort was directed at converting from oil to other fuels to the extent possible, reversing the previous trend of conversions to oil; and efforts also were directed toward increasing the efficiency in the use of all fuels. Moreover, to conserve European fuel stocks, a large part of the normal European bunkering load was shifted to West African ports nearer to the Persian Gulf and Caribbean sources of supply. Weather played an important part, as the winter was extremely warm. The combination of these factors softened the impact during the entire crisis period, and allowed Europe to continue its industrial activity without a serious slowdown.

Some of the measures which were taken during the Suez emergency may have a lasting effect on the use of residual fuels. As mentioned earlier, some of these things also affected the demand for distillate fuels, and the remarks which follow may generally be assumed to apply to both types of fuel. Consumers of fuel oil, spurred by necessity, found ways to economize in their operations and to use fuels more efficiently. Improved coal supplies are tending to lessen the anticipated reliance on fuel oils—at least for the short run. Industry in general is expected to slow down conversions from coal and other forms of energy to the use of oil, due in large part to psychological factors arising from the Suez emergency. There is a growing indication that the fast economic and industrial expansion observed over the past few years is slowing down. This, too, will have its retarding effect upon demand for fuel oils.

All these things considered, it is estimated that the growth rate for residual fuel oils will turn out to be only 7% for 1957 over 1956, and 14% for the year 1958 above the abnormally low 1957 level. This compares with a rate of growth averaging about 17% pre-Suez, and is considerably short of the rate of growth for 1958 which was generally anticipated prior to the Suez crisis.

Local Demand for All Products: Table V includes not only the three major products which have been analyzed up to this point, but also all other petroleum products such as kerosines, lubricants, aviation gasolines, jet fuels, refinery fuel, liquefied petroleum gas, and asphalts. Some of these products have been moving ahead at fairly rapid rates of increase during the postwar period, especially jet fuels and liquefied petroleum gas. While significant in themselves, the increase in the use of these products individually is not significant to the overall volume west of Suez.

The growth during 1955 and 1956, averaging 14% per year, is typical of the generally high rates of increase peculiar to this area since 1947. It is anticipated that 1957—with its concentration of the Suez effect in the first half of the year offset somewhat by recovery during the second half—will be only 6% above the 1956 level. For 1958, the 16% increase shown for the first half must be related to the 1% increase which occurred in the first half of 1957, and the 7% shown for the second half is more indicative of the general slowing down which has been described earlier. The combination of these two figures for 1958 results in the 11% increase above the abnormally low 1957 figure.

The pattern of the "consumption barrel" in this area has been characterized in recent years by two things:

A decline in the relative importance of gasoline consumption resulting from smaller percentage growth rates.
Increasing demand for distillate and residual fuels.

This trend is expected to continue through 1958, as indicated by the following tabulation:

CONSUMPTION WEST OF SUEZ 1955-58

	% of Total			
				Estimated
	1955	*1956*	*1957*	*1958*
Automotive gasolines	21	20	19	19
Distillate fuels (excl. kerosine)	21	22	23	23
Residual fuels	34	35	36	36
All other products	24	23	22	22
	100	100	100	100

Summary: Based on the data and assumptions presented in this review, the several major highlights of the petroleum demand outlook through 1958 would appear to be as follows:

The Suez crisis has tended to slow down the rate of expansion of oil demand in the area west of Suez because it:

a: Forced consumers to economize in their operations and use fuels more efficiently; this is likely to continue in some measure.

b: Caused European oil consumers to think more in terms of using other forms of energy.

The tailing off of the European industrial boom which is becoming noticeable will be felt in the oil markets in the form of decreasing percentage growth rates in oil demand, although total volume will increase.

The true indication of this slowing down in the Eastern Hemisphere—west of Suez—is most likely represented by the 7% overall demand increases noted for the second half 1958 vs. the like period of 1957, and the real significance is that the petroleum industry must now face up to a petroleum demand growth rate over the next two to four years about half what it was during the earlier postwar years.

In the Western Hemisphere—outside the United States, and in the Eastern Hemisphere—east of Suez,—local inflation, foreign trade, and payments difficulties continue to restrict demand for petroleum—with percentage growth rates following a downward trend since 1955, and volume increases for 1958 about the same level as expected for 1957

END

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International News and Notes

New Saudi Arabian Wildcat

Manifa No. 1, an offshore wildcat about 9 miles from shore, was spudded Sept. 30 by Aramco. It is 35 km. SE of Safiniya field. It is expected to go to 7,400 ft and will test the Bahrain and Zubair sands, both producers.

Tunisia Pipeline Survey

Survey of a pipeline from the Sahara to the sea is being made in Tunisia by Bechtel Corp. Cost is estimated at $75 to $90 million; completion date 2½ years. Total length would be about 360 miles.

Four-Year Concessions in Paraguay

Paraguayan government has granted officially nine concessions for oil exploration and exploitation. They are for four years and of 750,000 acres. Latest five are east of the Paraguay River, and include one to Compania Goyelita Petrolera y Minera Paraguaya SA, a new company. Stockholders include several persons each from Argentina and Paraguay; one Chilean; and one American (Mrs. Paulina Wich de Naerlovic, wife of one of the Argentine investors). Others are to Cervasic Recalde Cespedes, Amelio Martinez, Abraham Wishievsky, and Oscar Armando Gomez.

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Suez Loss Estimated

The most serious adverse impact of Suez was on Egypt and the Middle East oil-producing countries, according to the International Monetary Fund in its annual report at the end of September. Stopping of the canal and pipelines cut oil output in the area in half. By January, production was at two-thirds of normal, and by April it was still below normal. "The loss in receipts to the countries concerned will probably exceed $150 million," said the report. Iraq suffered most, because she depends upon the Iraq pipeline, which had been cut.

In contrast, Western Europe got off well, the report says. Expected were shortage of tankers, higher tanker rates, shortages of crude oil and oil products, steep rise in oil prices—and thus a sharp drop in industrial activity. Actually, says the report, most of the trouble expected was "less severe than had been anticipated."

Finally, one indirect impact of the crisis "had more effect than any fuel shortage." Thus auto sales fell off with the rationing of gasoline. And this hurt the level of industrial activity more than anything else, the report said.

Humble Drilling In Alaska

Humble Oil & Refining Co. started drilling on the Humble-Shell Bear Creek No. 1 in the Kanatak area of Alaska. The test well is being drilled by Humble for the joint account of Humble and Shell Oil Co. It is Humble's first drilling venture in Alaska. Drilling on the projected 12,000-ft test well started September 23. The site is on the Alaskan peninsula, about 350 miles southwest of Anchorage, and is inland from Jute Bay.

Gulf Says Oil Stabilizes

Ralph O. Rhoades, senior vice president and a director of Gulf Oil Corp., told members of the Boston Stock Exchange recently that "contrary to much that has been said or written, the presence of truly vast reservoirs of petroleum has now begun to act as a factor for the promotion of peace and stability in an area that has known precious little of either since the dawn of history."

Turning to USA oil industry, Mr. Rhoades said: "We now should be importing more of the Middle East production into this country, and eventually we must do so."

Mr. Rhoades declared: "We, in Gulf, do not like the arrangement (import restrictions) since it denies the company the opportunity to use its own foreign crude in plants built for that purpose, and since we do not believe that a critical factor of national security is involved in the import situation. But we were asked to cooperate and we have agreed to do so, bringing our scheduled imports down to a level that will meet the quota for the year ending June 30, 1958."

He pointed out there has been an attack on the percentage of depletion provisions of the present tax laws which allow depletion deductions on foreign production of American companies. "Our position is that percentage depletion is as valid on foreign production as on domestic, and for the same reason. The primary purpose of establishing and continuing percentage depletion is that the production of oil from its reservoir is an act that exhausts a capital asset. The depletion allowance provides for a return to the producer of a portion of his wasting capital, without string, and for whatever use he may see fit. It is based upon the same considerations that authorize the operator of some other kind of business to deduct depreciation on his plant and equipment. To say that its only purpose is to provide capital for further exploration is to say that the discovery of oil is, to that extent, subsidized. By the same token, it is essentially the same thing as saying that any manufacturer who writes off capital for the depreciation of plant structure is, to that degree, also accepting a subsidy from his government."

Middle East Pipeline Postponed

Proposed $800 million international oil-company pipeline to carry a million b/d from the Persian Gulf oil fields to the Mediterranean has been postponed indefinitely due to the political crisis in the Middle East.

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The world-wide Fraser Contracting Organisation offers a complete service for the design and construction of special purpose petroleum refinery plant. Recent examples include the Solvents Distillation Unit at ESSO Ocean Terminal, Purfleet, Essex (illustrated), the Autofining Plants at Llandarcy and Aden and The Platformate Splitter Units at Llandarcy and Isle of Grain, for the British Petroleum Co. Ltd.

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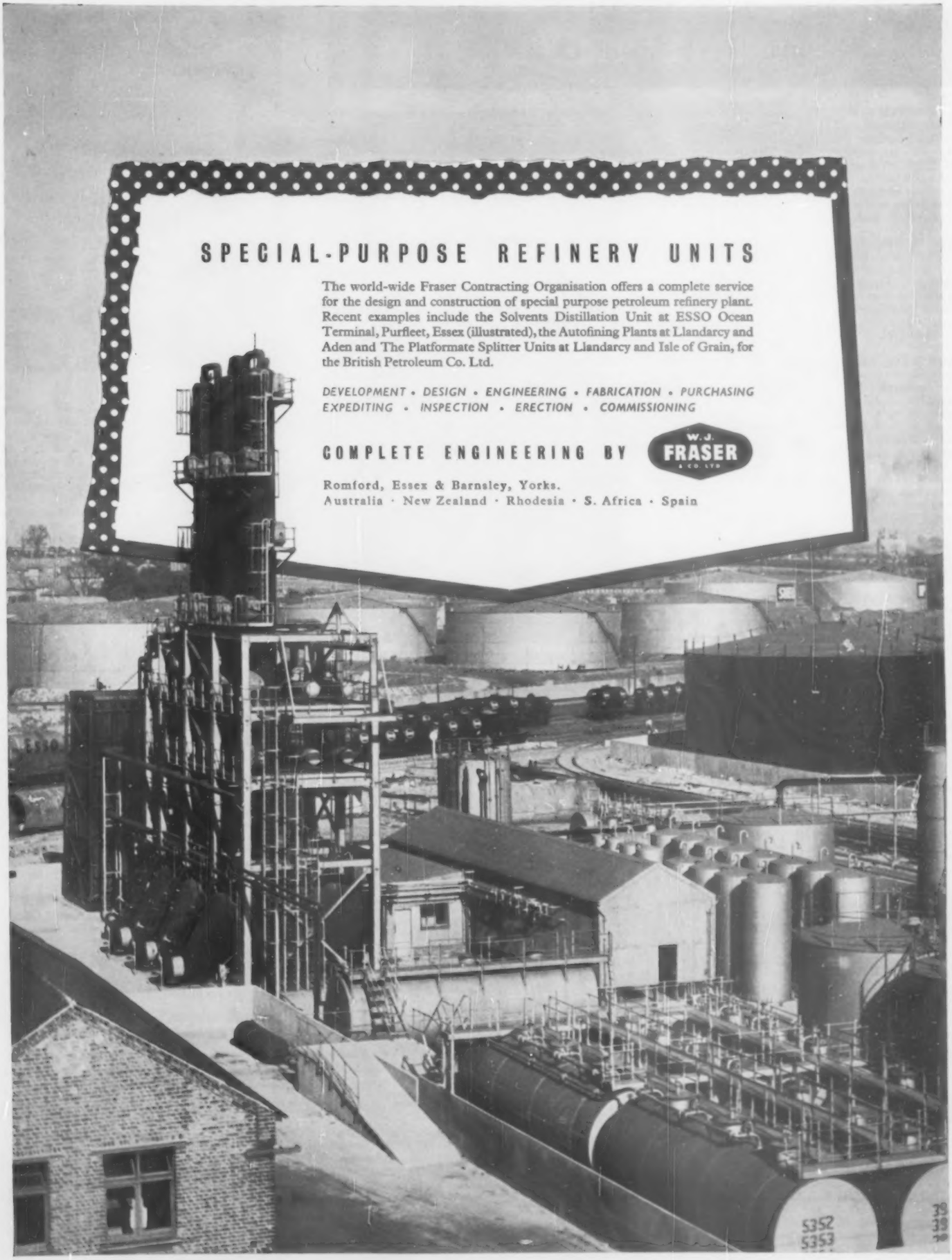

Oil Company Staff Changes

LAWRENCE G. HOOVER has joined the New York public-relations staff of the Creole Petroleum Corp. to handle press relations. Previously, Mr. Hoover was director of publicity for TIME Inc., publishers of TIME, LIFE, and FORTUNE. Before that, he was manager of the Young & Rubicam Inc., public-relations and publicity operations. Following World War II he was on the public-relations staff of the Automobile Manufacturers Assn., Detroit.

LEO M. WRIGHT, division geologist for Sinclair Oil & Gas Co. at Houston, has transferred to Sinclair Oil & Refining Co., Venezuela, as assistant chief geologist, headquartered in Caracas. Mr. Wright has a masters degree in petroleum engineering from Tulsa University and a Ph.D. in geology from Missouri University. He joined the Sinclair organization in June 1952.

ROBERT D. SMITH and RICHARD E. BAUMAN have been appointed division purchasing agents in the Standard Oil Co. (Indiana) purchasing department. Smith succeeds R. W. Ringrose, who retired after 50 years of service, as division purchasing agent in the field division. Bauman succeeds Donald T. Daegling, who retired after 41 years, as division purchasing agent in the supplies division.

D. E. STINES, has been elected a director of Creole Petroleum Corp. Mr. Stines, who was elected a vice president of the company on September 1, 1956, joined Standard Oil Co. (New Jersey) in 1929 at the Bayway refinery in Linden, N.J. He was appointed assistant manager of the export sales department of Creole, in New York, in December 1944. He transferred to the Jersey Standard coordination and economics department in New York as head of the coordination division in 1947. In 1952 he was appointed vice chairman of the coordination committee for Europe. From 1955 until September 1, 1956, Mr. Stines was special adviser on refining matters for Esso Petroleum Co. Ltd. in London.

C. R. VEGH GARZON of Montevideo, Uruguay, resigned on November 1 as advisor to Universal Oil Products Co. in South American matters. He now has offices in Montevideo, which are operated under the name Vegh and Vegh, Engineers. The firm will specialize in industrial and engineering activities representing European and North and South American firms.

HOWARD R. TATE has become a consultant for the Fifth World Petroleum Congress, scheduled to be held in June 1959. Mr. Tate joined the congress staff on retiring from Esso Research, October 31, after 38 years' service. He will be responsible for handling arrangements for all technical sessions and special events.

M. Wendell Ramsey

M. WENDELL RAMSEY has been appointed pipeline coordinator for the transportation department of Gulf Oil Corp. He will be responsible for the planning, programming, and coordination of Gulf's pipeline activities. Mr. Ramsey replaces William J. Wilkins, who recently was named president, Laurel Pipe Line Co.

WILLIAM A. REAMAN has been appointed manager of the Cartagena refinery of International Petroleum Co. Ltd., in Colombia. The refinery is now undergoing test runs, and will be inaugurated in December. Mr. Reaman joined an International subsidiary in Colombia 20 years ago. He has also worked for the company in Coral Gables, Fla., and in Talara, Peru, where he became refinery superintendent.

HARRY N. STAMPER has been named chief civil engineer for Humble Oil & Refinery Co. He succeeds S. W. Oberg, who has retired after serving as chief civil engineer for 20 years. William A. Castille, who was a division engineer in the Houston office, has been appointed assistant chief civil engineer, the position formerly held by Mr. Stamper.

CHARLES F. VAN BERG has been appointed petroleum advisor in the economics and budget department of International Petroleum Co. Ltd., at the latter's executive office in Coral Gables, Fla. He joined International last year, and prior to his new appointment was manufacturing manager of International Petroleum (Colombia) Ltd. Mr. Van Berg will be replaced in Colombia by Bryson M. Filbert, until recently manufacturing coordinator at International's executive office.

E. D. Loughney

D. L. Campbell

E. D. LOUGHNEY and **D. L. CAMPBELL,** both former vice presidents, have been appointed senior vice presidents of The British American Oil Co. Ltd. on forward planning of its operations and coordination. Mr. Loughney began his career in the oil industry nearly 30 years ago, and for many years he has been associated in major executive posts with the oil and natural-gas developments in western Canada. He is a director of several pipeline companies, including Trans Mountain, Interprovincial, Trans-Canada, Trans-Northern, Westspur, Montreal, and Portland. Mr. Campbell joined B-A after graduation as an engineer from the University of Saskatchewan and successively filled several important posts in the manufacturing department at refineries and head office. In 1948 he became manager of manufacturing, and in 1954 was appointed vice president. Mr. Campbell was elected a director of B-A in 1956. He is also a director of Trans-Northern Pipe Line Co. and BA-Shawinigan Ltd.

JOHN B. HANNA, since August 1, has been the new managing director of the Bombay, India, refinery of Standard Vacuum Oil Co. He was graduated by the University of Pittsburgh in 1935, with a degree in petroleum engineering. Starting his career in the petroleum industry with Esso Standard Oil Co., between 1935 and 1952 he worked at Esso's Bayway refinery in the technical process and mechanical department. In 1952 he was transferred to Standard Vacuum's Durban refinery as refinery manager, and in 1954 he became the managing director of that unit.

JOHN J. H. PHILLIPS will head the Ohio Oil Co.'s newly expanded advertising and sales promotion department. Mr. Phillips started sales-promotion work with the Atlantic Refining Co. in 1939. Later, at the Stockton West Burkhart Inc. advertising agency, he was a senior accounts executive in charge of The Ohio Oil Co. account. Since then he has been with Compton Advertising and Benton & Bowles working with major oil-company advertising accounts.

R. E. Kepke

ROBERT E. KEPKE has been appointed president and chief executive officer of The British-American Oil Producing Co. and its affiliate, The Toronto Pipe Line Co. For the past four years, Mr. Kepke has served as executive vice president of both companies, whose headquarters are in Dallas. M. S. Beringer, of Toronto, Canada, continues as chairman of the board of both companies.

A native of Texas, Mr. Kepke's career with The British-American organization began in 1941 as the company's legal counsel in Texas. Thereafter, in turn, he was appointed assistant to the executive vice president of the American companies, and a vice president and director of the British American Oil Co. Ltd. in Canada, before his appointment in 1953 as executive vice president of The British-American Oil Producing Co. and The Toronto Pipe Line Co.

HOWARD C. KAUFFMAN, Jr., has been appointed production coordinator of International Petroleum Co., Ltd., at the latter's executive office in Coral Gables, Fla.

FRED M. BUTLER, of Bartlesville, Okla., has been elected a director of Cities Service Oil Co. (Del.). Mr. Butler is manager of Cities Service Oil Co.'s industrial-relations division, and has been active in industrial and personnel-relations work for the company since 1930. He was named industrial-relations manager in 1941. Mr. Butler is a member of the Mid-Continent Oil & Gas Assn., and has served on several of its committees.

J. B. SAUNDERS and Breene M. Kerr have been elected to the board of Kerr-McGee Oil Industries Inc. Mr. Saunders is president of Triangle Refineries Inc., of Houston, a company acquired this spring by Kerr-McGee.

Mr. Kerr is a son of Senator Robert S. Kerr, founder and chairman of Kerr-McGee. A geology graduate of Massachusetts Institute of Technology, he joined the company's exploration department in 1953 after two years of military service. Transferred to the marketing division in June 1956, he is now systems evaluation engineer.

WINSTON S. PEELER has been elected vice president in charge of manufacturing and a member of the board of American Oil Co., New York,—succeeding the late Dr. Harold R. Snow, who had served since last February when he moved here from Texas City, Texas.

LLOYD RYMAN has been transferred to Caracas, Venezuela, as a staff member of Continental Oil Co. of Venezuela, Conoco subsidiary. Formerly division geologist at Corpus Christi, Texas, he has been succeeded by Jack M. Saunders.

FRED W. SCHEINEMAN has been named director of engineering in Standard Oil Co. (Indiana); Thomas A. Abbott, engineering administration manager; Dr. Robert B. Jacobs, engineering research manager, and George M. Keranen, general engineering department manager.

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Charles B. Towill

Towill Appointed By 5th World Petroleum Congress

Charles B. Towill has been appointed public-relations representative for the Fifth World Petroleum Congress Inc., it has been announced from the congress's headquarters at 527 Madison Avenue, New York 22, N.Y. The six-day congress, the first of its kind to be held in the United States, will open in New York's Coliseum on May 31, 1959. Mr. Towill was manager of the public-relations division of the Iranian Oil Participants Ltd., in London, until returning to New York in June this year. Previously he was with The British Petroleum Co. Ltd., and served with that company in Iran and in New York.

USA Energy Demand Doubles

A new study by the National Planning Assn., made public September 16, indicates total USA energy demand will at least double by 1980. Most of the increase will be met by coal, gas, and oil.

"Only a moderate increase, 15-20% in delivered prices, is to be expected—though the prices of particular energy sources, notably gas, may rise more rapidly," the study adds.

"There is little prospect of an imminent shortage of the conventional energy fuels," it adds; and, overall, nuclear power cannot count upon either shortage or very high prices of other fuels to make it competitive, but must rely upon better methods. Nuclear power by 1980 is expected to supply less than 10% of total USA energy consumption, and more than 20% of total electric-power generation, the study said. The study warned that curbs on crude-oil imports to the USA are to continue; nuclear energy could help hold the line on oil prices. Ralph J. Watkins, of Dun and Bradstreet Inc., was chairman of the NPA committee for the study. Walter J. Levy, petroleum consultant, was a member. Cornelius J. Dwyer, petroleum consultant, was a consultant to the committee.

English Firm Manufacture S&J Equipment

Whessoe Ltd., Darlington, England, has been appointed manufacturing licensee for Shand and Jurs Co.'s new line of electrical remote-control and supervisory equipment for the petroleum, chemical, and processing industries.

New electrical products to be made by Whessoe, for sale in the United Kingdom, include S&J Telepulse remote reading, gaging, and temperature systems and remote-function control systems, Gardtrol pump motor monitors and valve monitors for remote supervisory control, and Selsyn and electronic remote-reading level and temperature gages and systems.

Under the new arrangement, Whessoe will also continue as manufacturing licensee for S&J mechanical storage-tank fittings. The companies share many sales representatives outside the continental United States, thus assuring complete market coverage. Shand and Jurs is a subsidiary of the General Precision Equipment Corp., New York.

API Gold Medal to Lewis

The American Petroleum Institute's "Gold Medal for Distinguished Achievement" was presented during the API annual meeting, November 11-14, to Dr. Warren K. Lewis, of Newton, Mass., professor emeritus of chemical engineering at Massachusetts Institute of Technology.

An outstanding teacher for nearly a half-century, Dr. Lewis is known as an international leader in petroleum research, and as an engineer whose imagination and research have led to great advances in the industrial fields of rubber, leather, cellulose, and amorphous materials in general. He is credited with scores of contributions to the oil business. He developed or played major roles in the perfection of efficient methods of fractionation in refining; of the solvent recovery systems; of vacuum distillation of lubricating oils; and of the widely-used refining process, fluid catalytic cracking. His more fundamental studies have led to significant discoveries on the structure of liquids, the flow of heat and liquids, and in such fields as the gasification of coal and the synthesis of hydrocarbons. He also was instrumental in the development of water-drive systems for the recovery of crude oil, of means for displacing crude from oil-bearing formations, and the formulation of drilling muds resulting in more efficient drilling operations.

Dr. Lewis is regarded uniquely as the man who actually acquainted the petroleum industry with chemical engineering, and made it chemical engineering-minded. In the years of his service as an educator and scientist, he personally acquired more than 60 patents applying to petroleum.

New Jersey Financing

Directors of Standard Oil Co. (New Jersey) have decided to raise approximately $250 million to $300 million of additional capital later this year by offering to shareholders rights to subscribe to additional capital stock. The number of shares and the price at which shares will be offered have not yet been determined. The offering will be made only by means of a prospectus, following registration with the Securities and Exchange Commission.

During the postwar period, Jersey has made very large expenditures for capital equipment and in the search for oil. The proceeds of the proposed issue are intended to enable the company to continue to meet these capital requirements. Morgan Stanley & Co. will be asked to form a nationwide group to underwrite this financing.

New Texaco Tankers

The Texas Co. has announced that it proposes to contract for the building of six additional 46,000 dwt tankers for use in foreign service. Specifications call for a designed service speed of 16½ knots, and the new buildings will supplement the company's present and contracted-for fleet of crude-oil carriers.

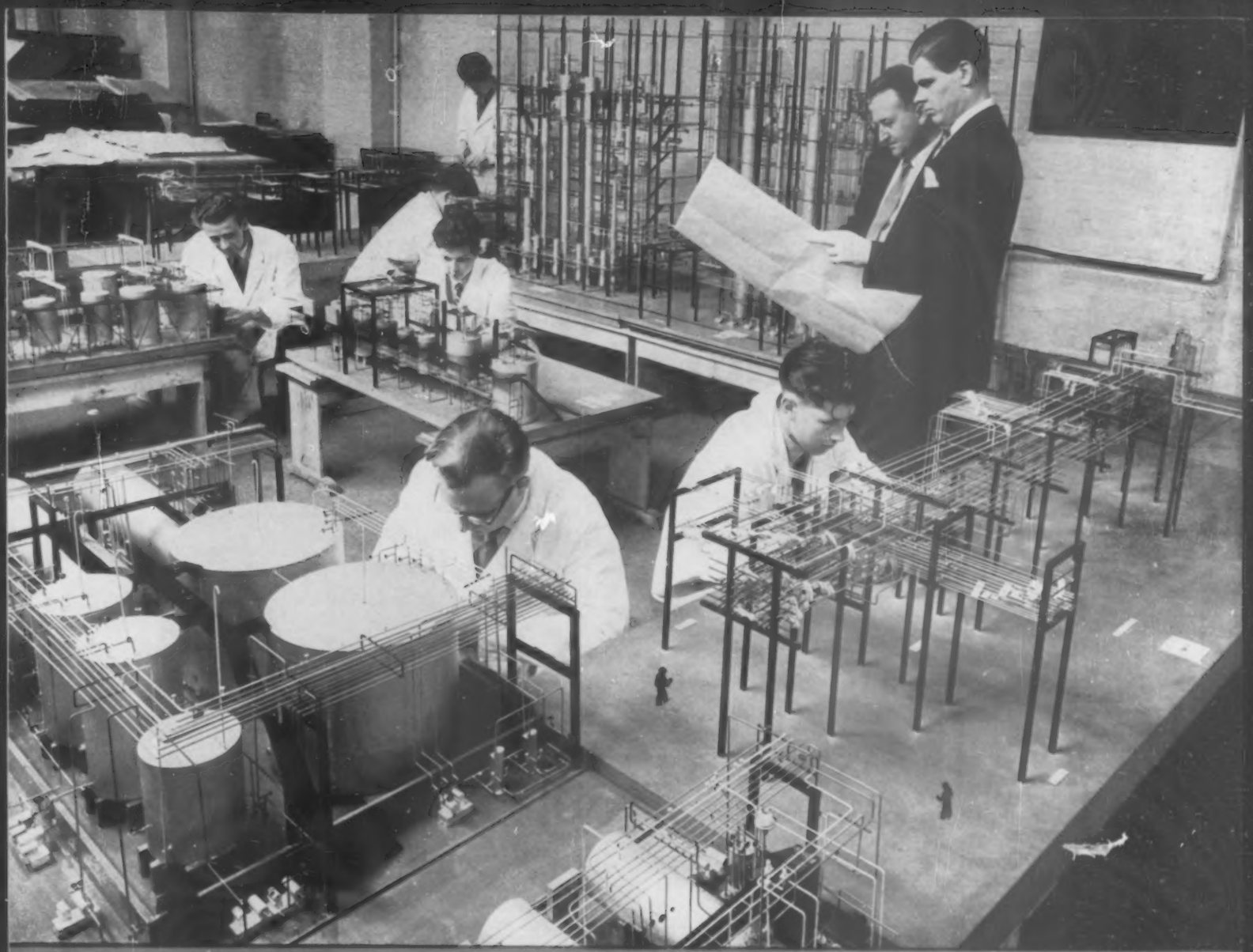
Dr. Warner K. Lewis

Cities Service Stock Plan

More than a third of the employees of Cities Service Co. and its subsidiaries are now part owners of the company, following the plan's first five years of operation to July 31, 1957. Under the plan, the company contributes one dollar for each two dollars invested by the employee. Each employee chose one of three savings options; and his money has been invested in USA Series "E" bonds, a stock mutual fund, or stock of Cities Service Co., or any combination of the three, as he elected. Monthly allocations were made from the salaries or wages of the employees who participated up to a maximum of 5% of total pay. This maximum has since been raised to 8%, with the maximum permissible allocation determined by length of service.

At the end of the first five-year period 7,621 employees sharing in the plan had in their thrift accounts 222,109 shares of the company's common stock, or an average in excess of 29 shares per employee. As of August 1, these shares had a total market value of $15,127,798, but the cost to the employees, in payroll deductions, amounted to only $6,374,857. The remainder was made up of employer contributions, reinvested dividends on the stock, and appreciated market value.

1958 officers of the American Association of Oilwell Drilling Contractors, elected at the 17th Annual Meeting in Tulsa back row, left to right are: Brad Mills, executive vice president; J. J. Harrigan, vice president; W. L. McClusky, secretary-treasurer; Herbert Woolf, vice president; B. A. Wales, vice president; Lloyd R. Pickrell, vice president. Front row, left to right, Jack H. Abernathy, incumbent president; Marion S. Church, general counsel; J. U. Teague, president-elect; Frank E. Frawley, national vice president; and B. F. Gilchrist, vice president.



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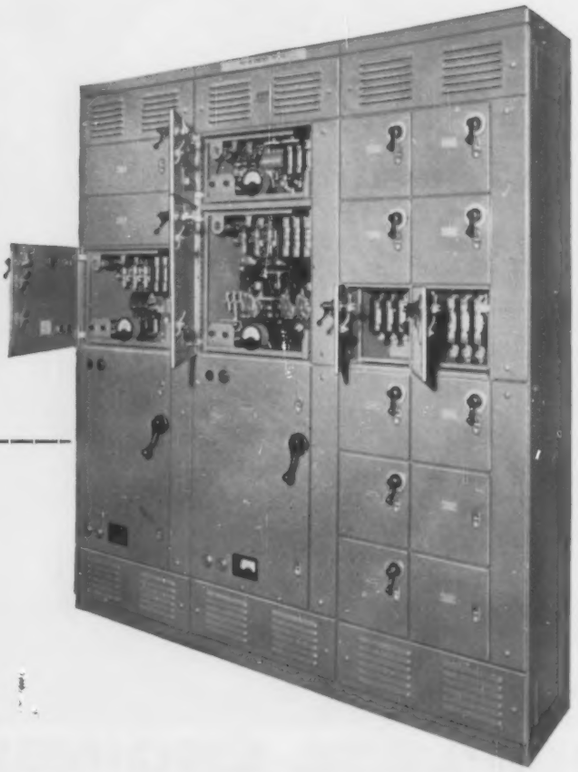

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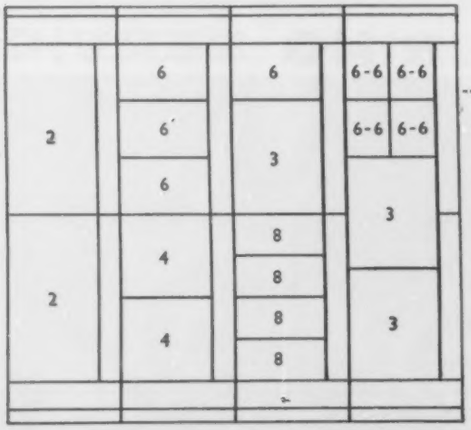

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This gasoline plant operates efficiently despite

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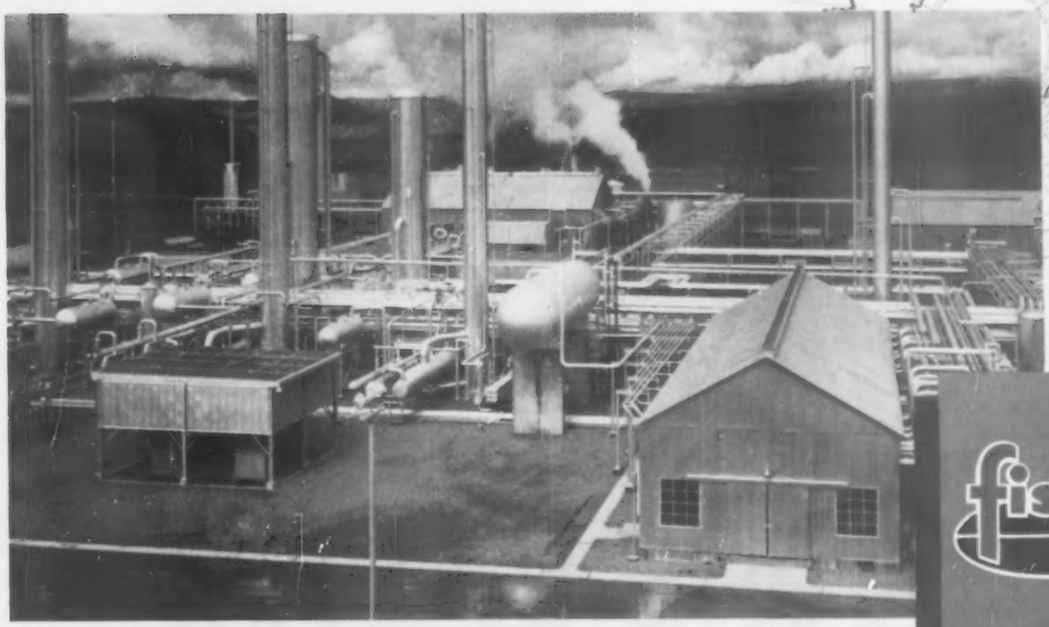

The San Juan gasoline plant of the Pacific Northwest Pipeline Corporation is big! It was designed to handle 300 million cubic feet of gas per day and recover 340,000 gallons of liquids. But efficient operation over a wide range of loads was necessary.

Since it was placed on stream in October, 1956, the San Juan plant has operated efficiently and dependably at loads ranging from 20 per cent to nearly 100 per cent of capacity. This is an unusual record for a plant of this size.

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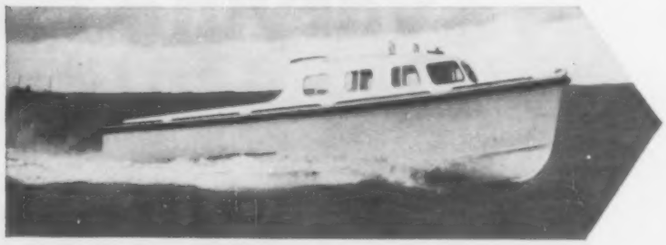

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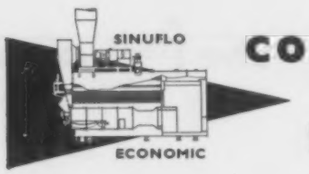

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Canadian Gas

(Continued from page 39)

Co. has given a letter of intent to the El Paso group for purchase of 200 mmcf per day to help satisfy the growing California requirements which it estimates at 100 mmcf per day average increase each year for the next five years. It was intended that this would be supplied by Westcoast through the proposed additional 260 mmcf per day throughout to be made available in 1958.

Both these companies are considering seriously whether, in the face of a delay of indefinite duration, they can afford to gamble on a favorable decision from Canada eventually, or whether they will have to make other arrangements which would be less satisfactory for continuity of supply and bulk volume. Canadian producers, of course, are desperately anxious to fulfill these contracts before they are lost.

The Trans-Canada export has already been prejudiced by a recent Federal Power Commission award of a permit to several United States companies to supply about half the share of the Chicago expansion market which Trans-Canada was seeking. There is no doubt among Canadian producers that Trans-Canada needs this market to enable it to carry anywhere near the capacity of its big-inch line to eastern Canada, due for completion late in 1958.

The next move by western producers will probably be a concerted invasion of Ottawa over the next few months, backed by what they hope will be by that time a mounting volume of public opinion in favor of opening the trade barriers. There is persistent rumor that the present conservative government, lacking a clear working majority, will call an election in the early spring—possibly in April. The companies hope that they can convince the conservatives that public opinion would support a free gas export policy and reject a continuation of the present restriction.

Meanwhile, Sir Henry Borden is in Brazil, conducting delicate negotiations with the Brazilian government in respect of his own company, Brazilian Traction, which has serious foreign-exchange problems arising out of its tremendous operations in Brazil, where it earns all its revenue. He will not be back in Canada until the end of the year, and thus the royal commission can hardly even have its itinerary planned before the end of January or early February. The impression in the petroleum industry is that the dominion government will have to make up its mind on an election campaign policy long before there is any indication of how the presentations to the royal commission will be versed.

A troublesome element in the whole gas picture is the official attitude of the Alberta government, which has complete control over the source of supply and thus is essential to the whole settlement. Alberta rural citizens are still solidly opposed to export of gas—on the mistaken assumption that, if gas is retained in the province, every farm will have its own little supply line from the nearest gas well. The provincial government, depending heavily on farm votes, has always skated around this difficult problem, and has issued gas-export permits most reluctantly, even in the face of numerous geological submissions at its own technical hearings to the effect that an undisposable surplus is being built up.

Alberta has not yet entered the present battle officially, although top government officials have made representations to the prime minister about the economic distress caused by the tight markets for crude oil. Whether they will officially enter the gas campaign on the side of the producers remains to be seen. The producers feel—quite rightly—that a definite declaration of Alberta government policy would exert great influence on the dominion government.

Offsetting this economic weight is the uncomfortable fact that the Alberta government is Social Credit. The national Social Credit Party, almost entirely from Alberta, has officially supported the conservatives in the present parliament; but it has so little strength with only a dozen members of parliament that it cannot give the conservatives a working majority even with its support. Thus, politically, it appears to carry practically no weight at all, and its support might even be embarrassing if the conservatives can secure a working majority out of the next general election. This appears to be the policy on which they are gambling right now.

The concensus is that, regardless of what happens before the next general election, there is not the slightest chance of the dominion government's revising its policy on gas export immediately, and the companies are looking for a long, tough, and possibly unrewarding fight. END

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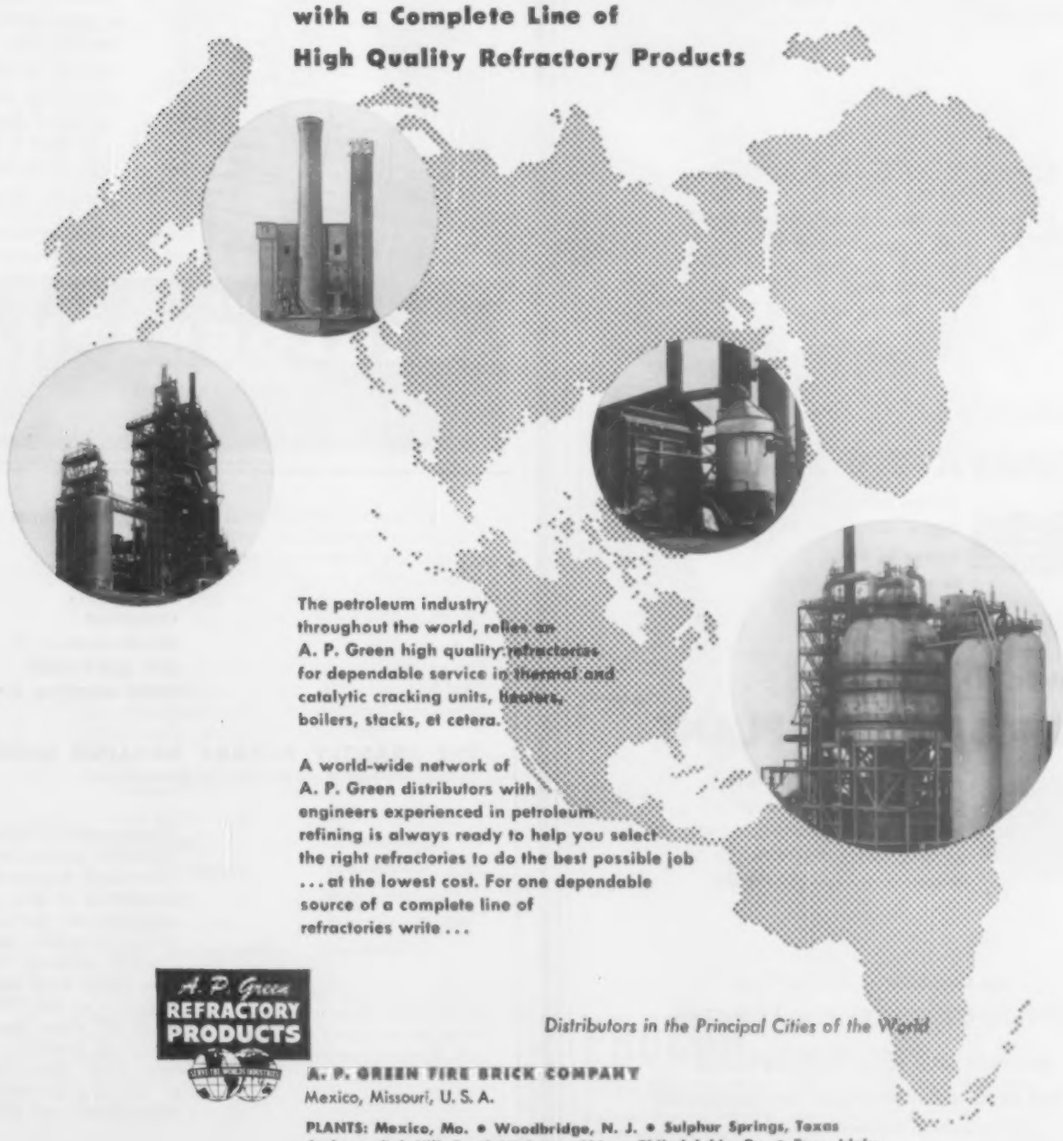

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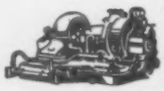

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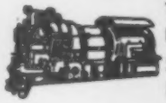

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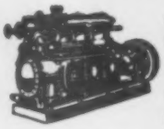

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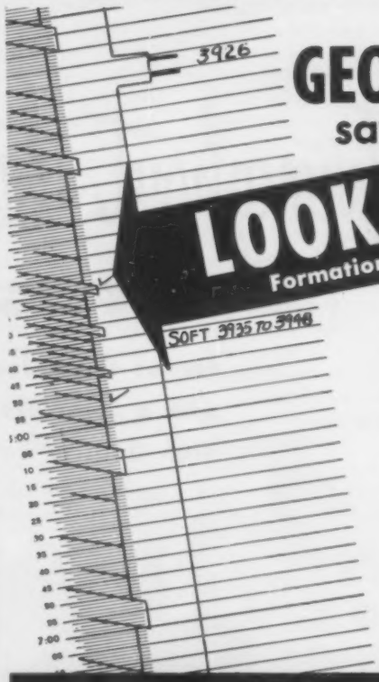

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Atmospheric, Cresol and Vacuum Distillation units	**Gas Concentration units**
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Poly plants	**Office buildings**
Catalytic reformers	**LPG facilities**
Rexformers	**Hydrosulfurizers**
Thermal crackers	**Complete refineries**
Waste disposal systems	**Turnarounds**

That's only a partial list, but if you have a project in the planning stage you can be certain that Procon has the experience, know-how and adequate facilities to handle it. Just give us a chance!

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WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL, AND CHEMICAL INDUSTRIES

R. G. Hamaker

Reed Opens Holland Plant

Reed's first overseas subsidiary, Reed Roller Bit Co. (Nederland) NV., opened its rock-bit manufacturing plant at Leiden, Holland, August 20.

This new facility will permit operators to purchase Reed bits for guilders or other currencies which can be exchanged for guilders. R. G. Hamaker, president of Reed Roller Bit Co., was in Leiden for the ceremonies. F. L. Tyler, formerly California sales division manager for Reed, is the manager of Reed NV.; and John Workman, formerly an engineer for Reed in Houston, is co-manager.

Europe's Petrochem Rising

Petrochemical production in Western Europe will exceed one million tons a year by about 1959 compared with 600,000 tons at present, according to Dr. Colin Haley, of Esso Research Ltd., Abingdon, England. He told the 30th International Congress of Industrial Chemistry that, in the next five years, output of chemicals-from-oil should continue to rise to some 1½ million tons annually.

The plastics industry, he said, is probably the most rapidly expanding of all the important markets for petrochemicals, with polyethylene showing the most rapid increase in consumption.

Nine Months' Earnings Drop 12%

Returns from 32 oil companies indicate net earnings for the first nine months of 1957 were almost 12% under those for the same 1956 period. First nine months' earnings in 1957 totaled $3,399,117,000, compared with $3,515,522,000 in the first nine months of 1956. Following are the figures for the 32 companies:

NET INCOME FIRST NINE MONTHS—1957
(Thousands of Dollars) $

COMPANY	NET INCOME 1957	NET INCOME 1956	PER SHARE 1957	PER SHARE 1956
Arkansas Fuel Oil Corp.	5,917	5,746	1.56	1.51
Ashland Oil & Refining Co.	16,219	13,503	2.52	2.13
The Atlantic Refining Co.	29,337	32,739	3.15	3.53
Aztec Oil & Gas Co.	720,603	386,808	.32	.17
Barber Oil Corp.	17,413	491,537	.02	.67
Bishop Oil Co.	161,913	307,747	.29	.55
Champlin Oil & Refining Co.	7,249	6,742	1.70	1.58
Cities Service Co.	45,656	43,491	4.43	4.30
Clark Oil & Refining Corp.	1,083	2,021	.83	1.64
Colorado Oil and Gas Corp.	2,139	1,996	56.2c	52.4c
Creole Petroleum Corp.	318,807	240,610	4.11	3.10
Getty Oil Co.	15,518	6,274	1.05	.41
Imperial Oil	58,421	51,138	1.85	1.62
International Petroleum Co. Ltd.	33,100	28,700	2.28	1.98
MacMillan Petroleum Corp.	90,802	153,380	.09	.15
The Ohio Oil Co.	32,007	30,295	2.44	2.31
Phillips Petroleum Co.	74,227	71,570	2.16	2.08
The Pure Oil Co.	26,147	26,210	3.04	3.06
Richfield Oil Corp.	21,774	20,768	5.44	5.19
Shell Oil Co.	105,797	100,143	3.50	3.30
Sinclair Oil Corp.	62,879	66,032	4.11	4.51
Socony Mobil Oil Co. Inc.	183,000	183,000	3.87	4.19
Standard Oil Co. of Calif.	211,765	190,355	3.35	3.01
Standard Oil Co. (Indiana)	113,872	114,990	3.21	3.36
Standard Oil Co. of Kentucky	9,559	9,561	3.67	3.67
Standard Oil Co. (N.J.)	660,000	603,000	3.35	3.07
Standard Oil Co. (Ohio)	14,581	20,158	2.90	4.06
Sun Oil Co.	39,013	39,796	3.63	3.92
Sunray Mid-Continent Oil Corp.	45,000	31,500	2.44	1.66
The Texas Co.	243,103	207,429	4.43	3.78
Union Oil of California	27,675	26,107	3.59	3.38
Union Oil & Gas Corp. of La.	4,541	2,176	2.50	1.20
Totals	3,399,117	3,515,522		

New Deep Test In Borneo

Preparations are complete for Seria's (British Borneo) second 'deep-test' well, which will test formations below known oil- and gas-producing sands of the Seria field, using a 12,000-ft rig.

United Fruit Acquires Panama Acreage

Cataract Mining Corp. has announced a further step in the development of the five million acres of oil and gas leases which it owns and controls in the republic of Panama. In line with this, United Fruit Co. announced it had acquired the rights to explore for petroleum over an area of one million acres in the province of Chiriqui in the republic of Panama. The concession referred to is one granted to Cataract which was dealt to Time Petroleo SA, a subsidiary of Time Petroleum Co., of Wichita, Kans., which in turn conducted the negotiations with United Fruit Co.

The concession acquired by United Fruit from Cataract lies in an area where United Fruit has done business for many years.

Discovery in Saudi Arabia

The discovery of oil in a wildcat well 90 miles northeast of Riyadh, the capital of Saudi Arabia, has been announced today by the Arabian American Oil Co. The well, known as Khurais Well No. 1, is located some 150 miles southwest of Dhahran, Aramco's headquarters. It is the first well to be drilled on the Khurais structure, which is in the Dahana, a belt of active sand dunes east of the central plateau. The structure was located by gravity meter and structure drill surveys.

Drill stem tests of the Arab "D" member of the Arab Zone between 4,755 and 4,898 feet indicated production rates up to 3,000 b/d. The oil is 31° A.P.I. at 60° F. and is sour. Operations to evaluate the discovery are continuing.

IMMEDIATE DELIVERY FROM STOCK
All Steel
New "Equity" 45' diesel tug
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Wire or phone today!
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If it's a difficult non-ferrous casting—consult Birkett, Billington & Newton. On the right is an example of what they can do. It is one of a pair of housings for the driving shaft of an independently sprung wheel. To withstand severe shocks and stresses it was cast in high tensile manganese bronze and then precision-machined. Birkett, Billington & Newton have the facilities and knowledge to solve your non-ferrous casting problems—however difficult.

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Anywhere Anytime

New Services • • • New Tools • • • New Methods • • • Outstanding Results

LITERATURE AVAILABLE

If you have not received your copy of our 8-page pamphlet on McCullough Radiation Well Logger, just write McCullough Tool Company, 5820 South Alameda Street, Los Angeles 58, California. We'll send your copy by return mail.

Four Wells Logged and Perforated in 12 Hours

Operator of this Arkansas lease required that all four wells in the project be logged and perforated in one daylight operation.

Average depth of operation was 2200'. Wells were cased with 4½" O.D. 9.5 lb. cemented casing. A portable mast was used on each job. Wells were approximately three miles apart.

McCullough Gamma Ray, Neutron and Collar Logs were run, obtaining 800' of 5" scale then dropping back to bottom and logging to surface on 2" scale.

From 12' to 17' of zone was perforated in each well using 3⅛" O.D. McCullough 30-shot M-3 Guns. A Total of 378 improved ½" Ogival Bullets were fired in the four wells.

Logging and perforating the four-well project required 12 hours, starting at 7:00 A.M. and finishing at 7:00 P.M. Operator was well pleased with speed, efficiency, trouble-free operations, and completion of the job in the allotted time.

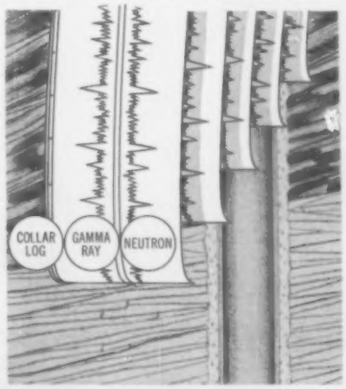
Tough Well Successfully Logged by McCullough

Electric Logs Not Informative – McCullough Radioactivity Log Proves Accurate and Reliable Despite High Pressure and Temperature, Shale Content of Formation and Chemical Mud

A fine example of the efficiency of McCullough's Radiation Well Logger in obtaining reliable and informative logs was recently reported from one of the Mountain States.

This was a wildcat well, drilled to a total depth of 16,500 feet. 5⅛" O.D. 15⅛, 18 and 24 lb. casing had been set and cemented to total depth. Bottom hole temperature was 300°. Formation to be tested was the Mesa Verde which is very shaley throughout the Rocky Mountain area.

Two different types of electric logs had been run in open hole by another service company. Neither had proved of value in providing accurate formation information due to high pressures, shale content of the formation and chemical content of the drilling fluid.



Accurate, Clear, Detailed, REPEATABLE Gamma Ray and Neutron Curves

Stability is an important characteristic of McCullough's Radiation Well Logger with Scintillation Counter. It will faithfully duplicate results when run repeatedly under identical conditions.

After casing was set McCullough ran a combination Gamma Ray, Neutron and Collar Log over the bottom 6,500 feet of hole. Actual logging time from start of in-hole log to top of out-hole log was six hours.

The resulting log proved very stable over the entire period of operation. From it, McCullough's Logging Engineer and oil company engineers pin-pointed the formations to be perforated, determined porosities and obtained an accurate sand count. Also, the log accurately correlated with drilling measurements and casing collar locations.

The operator was very satisfied with the successful results of the logging operation.

The jobs described above are certified to be true field reports of services rendered.

McCullough® TOOL COMPANY

Cable Address: MACTOOL

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HOUSTON
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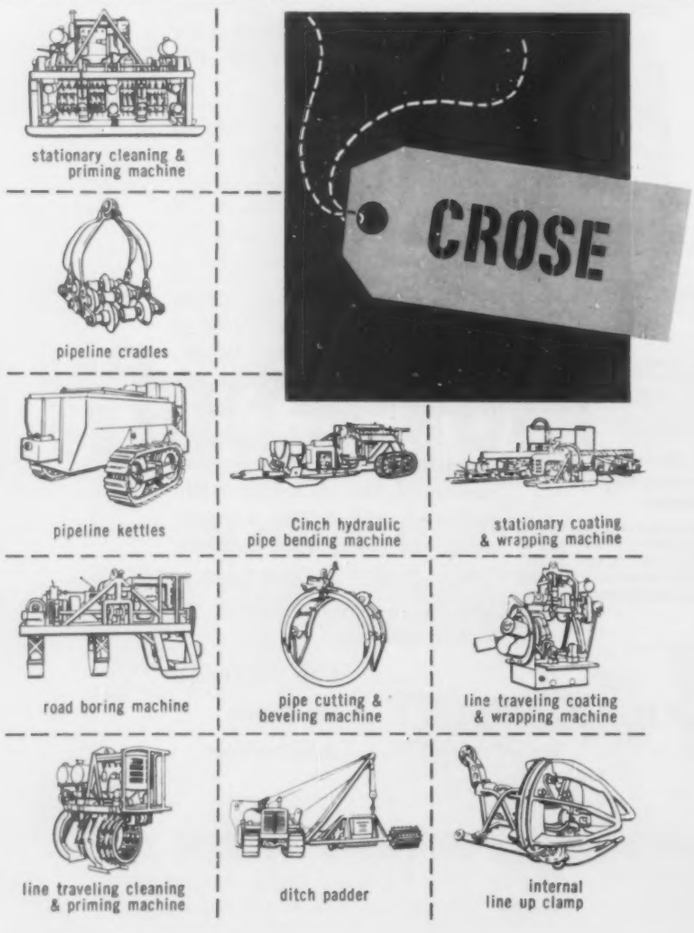

THIS NAME ASSURES QUALITY PIPELINE EQUIPMENT

At Crose the word "quality" means two basic things. First, that the equipment has been engineered and designed to perform under the toughest conditions. Secondly, that the equipment will deliver long-term performance with maximum efficiency and lowest maintenance costs. That's the kind of quality you get in Crose equipment — and it's available through many strategic supply points.

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"Vokes 'Top Servicing' lubricating oil filter makes life a lot easier!"

'Top Servicing' is yet another Vokes development. It cuts maintenance time to a minimum — saves man hours and money. You simply unscrew the clamp ring, remove the cover plate and inner seal, and withdraw the filter element. The clamp ring may be locked in any radial position, a particularly useful feature in confined spaces. 'Top Servicing' is typical of Vokes practical approach to filter problems. If you have a filtration problem please contact our engineers. They will be glad to help you.

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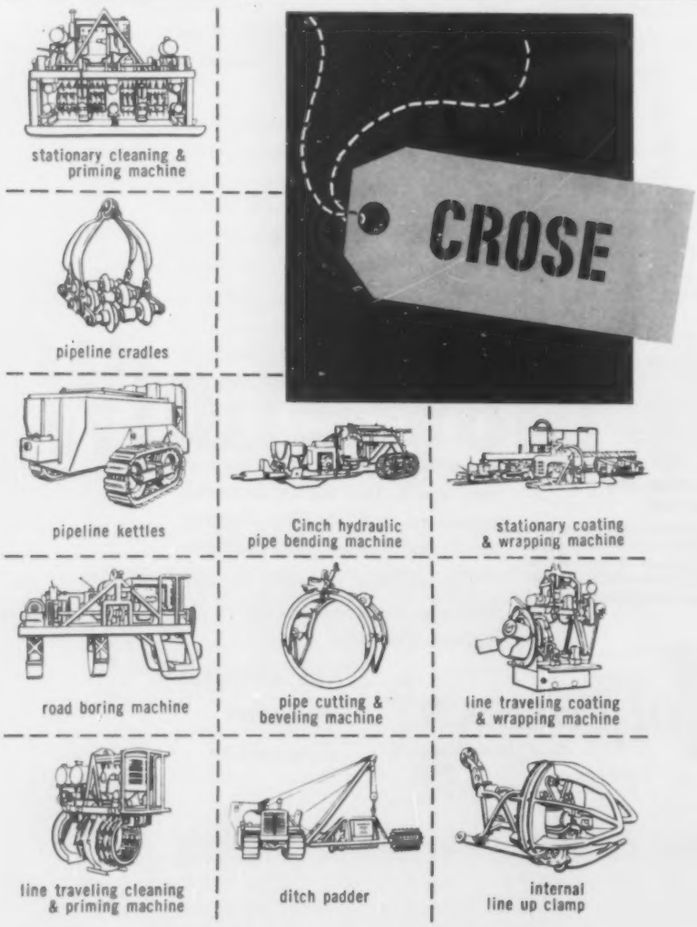

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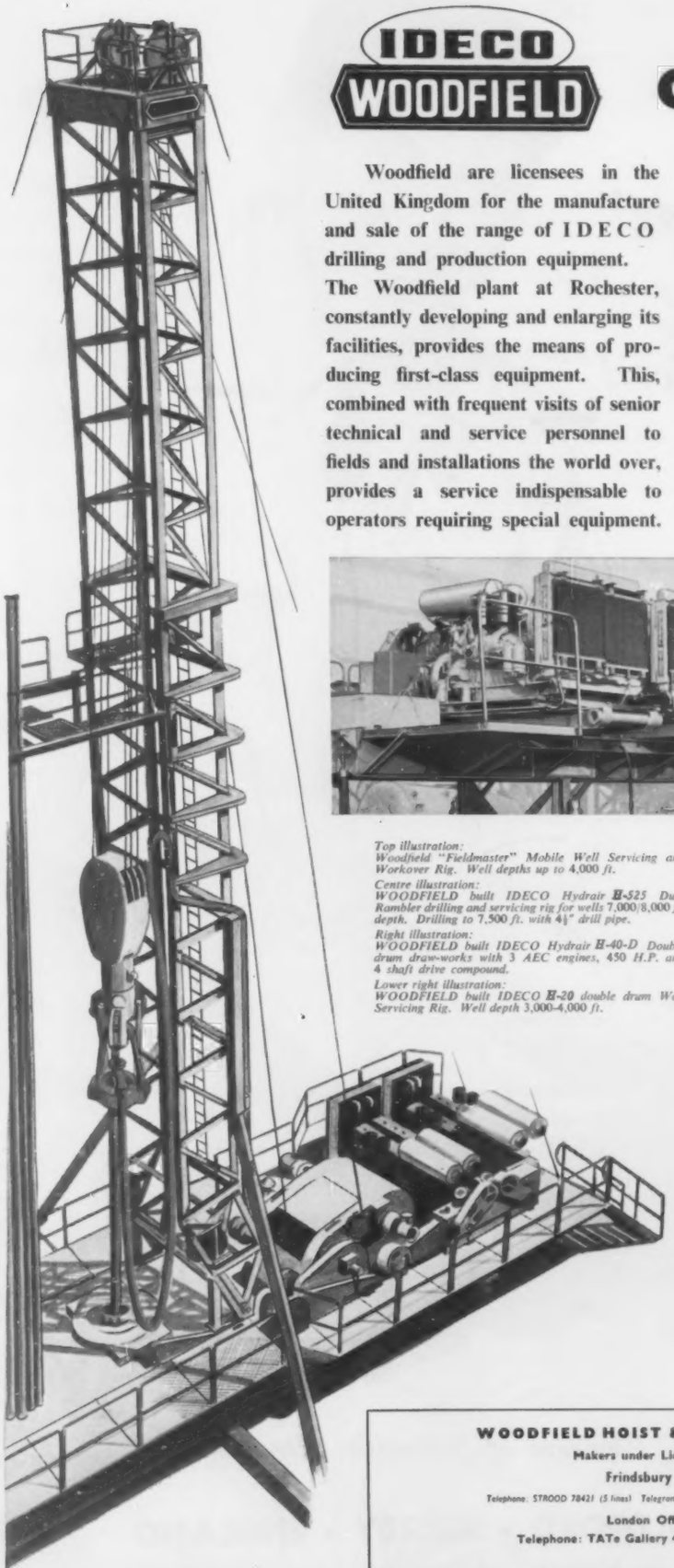
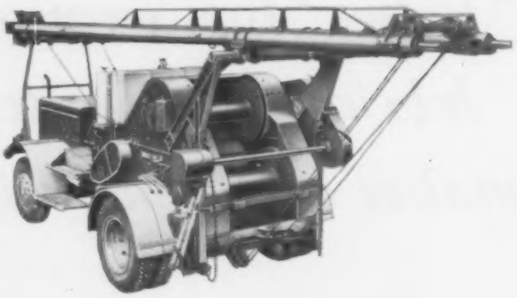


IDECO WOODFIELD OF ROCHESTER

Woodfield are licensees in the United Kingdom for the manufacture and sale of the range of IDECO drilling and production equipment. The Woodfield plant at Rochester, constantly developing and enlarging its facilities, provides the means of producing first-class equipment. This, combined with frequent visits of senior technical and service personnel to fields and installations the world over, provides a service indispensable to operators requiring special equipment.

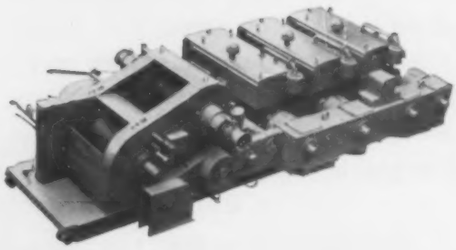


Top illustration:
Woodfield "Fieldmaster" Mobile Well Servicing and Workover Rig. Well depths up to 4,000 ft.

Centre illustration:
WOODFIELD built IDECO Hydrair H-525 Dual Rambler drilling and servicing rig for wells 7,000/8,000 ft. depth. Drilling to 7,500 ft. with 4½" drill pipe.

Right illustration:
WOODFIELD built IDECO Hydrair H-40-D Double drum draw-works with 3 AEC engines, 450 H.P. and 4 shaft drive compound.

Lower right illustration:
WOODFIELD built IDECO H-20 double drum Well Servicing Rig. Well depth 3,000-4,000 ft.



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Men who know tool joints . . .

specify AMERICAN IRON *Straight Grip*

"Knowing" tool joints doesn't necessarily mean knowing tool joint technology, even though, with Straight Grip, service in the field is a direct result of proper design and research by the manufacturer.

Knowing a tool joint means knowing and depending on what it will do under all conditions, good and bad . . . knowing that it will not torque off; that under extreme high pressures the pipe threads will hold a seal; that the tool joint will withstand more punishment than the pipe; that quick replacements are available and will be installed right at the rig . . . and knowing that Straight Grip is the finest available.

Men who *know* tool joints specify Straight Grip from experience. Longer life, trouble-free operation, additional footage at less per-foot cost, plus the guarantee of satisfaction because it's American Iron.

When you make *your* next tool joint purchase, specify American Iron Straight Grip . . . you'll be buying experience and reliability.

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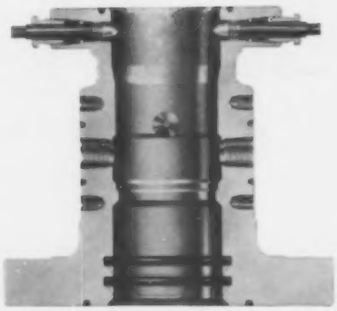
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

TYPE "UA" ATTACHMENT



UNIVERSALLY ACCEPTED

THE UNIVERSAL TUBING HEAD ANOTHER O-C-T ACHIEVEMENT

This new and highly versatile tubing head permits an operator, regardless of well conditions, to complete wells singly or dually at will with complete control at all times.

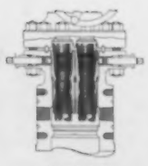
Whether you are drilling a well with a multiple completion in mind or not, the O-C-T Universal Tubing Head permits any last minute change in completion procedures without the necessity of changing tubing heads or using special attachments.

Check these outstanding features:

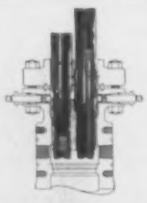
- Any API Head can be readily converted to a Universal by installing the UA attachment directly on top of the existing tubing head.
- Retractable aligning screws are used to align the dual hanger with respect to the head itself.
- These screws are placed in a retracted position when single string hangers are used.
- All hangers are run through, landed and locked in place prior to the removal of the blowout preventers.
- Once the head is installed, all seals can be field tested through test ports located in the flanges.
- The Universal Head is available in 600 through 2900 series and flange sizes from 6" to 10" for casing sizes 5½" through 7".

NO OTHER TUBING HEAD IS SO RUGGED, NOR SO VERSATILE

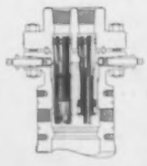
DUAL STRING HANGERS



TYPE U-60

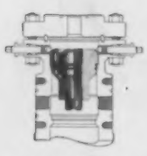


TYPE U-70



TYPE U-80

SINGLE STRING HANGERS



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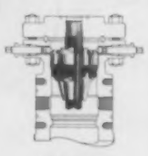
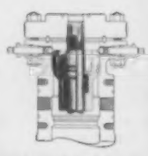


TYPE U-40



TYPE U-50

O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Export Representatives: South America — East West Oiltools, C. A., Del Lago Hotel, Maracaibo, Venezuela. Address Export Inquiries for All Other Countries to P. O. Box 3091, Houston, Texas.